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ABSTRACT

This study investigated three aspects of Internet-based community college classes: the distribution of learning styles of the students enrolled, student preferences for specific methods of instruction, and the relationship between student learning styles and preferences for methods of instruction. The results of the study might help educators better understand how to address learning styles as a student attribute in designing Internet-based instruction. Questionnaires were sent to 54 instructors and received 24 responses, for a response rate of 46%. The instructors who participated offered classes in 15 different subject areas. Surveys were distributed to 28 of the classes taught by these 24 instructors. One hundred and fifty of the 812 students contacted responded to the surveys: 82% of survey respondents were female, while 70% of all students enrolled in the classes were female. Respondents ranged in age from 17 to 63, and 71% had completed some college but did not have a degree. Forty-two percent of respondents were pleased with Internet classes in general, while 16% indicated they did not like Internet-based instruction. Ratings could range from 1 to 8, with 1 indicating very poor quality, and 8 indicating excellent quality. E-mail received a rating of 7 for methods of instruction, while instructor control of computer was the lowest rated, with a 6. (Contains 15 tables and 51 references.) (NB)

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University of Nevada, Reno

ED 468 381

An Investigation of Methods of Instruction and Student Learning Styles in Internet-based Community College Courses

A dissertation submitted in partial fulfillment of the
requirements for the Doctor of Philosophy in
Educational Psychology

by

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Abstract

This study investigated learning styles and students' perceptions of the helpfulness of Internet-based methods of instruction among students enrolled in Internet-based courses at the four Nevada community colleges. Soloman and Felder's Index of Learning Styles was used to determine student learning style preferences. A one-sample Chi-Square test showed the study group included significantly more *reflective* learners than general college populations studied by Kolb (1976), (Chi-Square = 6.37, p=.012). This supports the idea that *reflective* learners would be more likely to enroll in the Internet-based course included in the study. A separate one-sample Chi-Square test also supported the idea that students with a preference for the *global* learning style were less likely to complete these Internet-based community college courses (Chi-Square = 7.93, p = .005.). Because these tests did not involve direct comparison of groups, the evidence they provide is weak and further study in this area is recommended.

An analysis of students' helpfulness ratings for thirteen specific methods of instruction indicated students found Internet-based instruction to be helpful in learning course material, and e-mail and a detailed course schedule were perceived as the most helpful elements of a course. Chat and instructor control of the student's computer were perceived as the least helpful elements of a course. These results should be interpreted with caution as there was evidence that helpfulness ratings were influenced by the quality of the implementation and overall course satisfaction. No significant correlations were found between learning styles and perceived effectiveness of methods of instruction. Methodology issues with this study indicate the need for additional research in this area.

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Chapter 1

Introduction

Overview

The Internet has become a popular medium for delivering training and instruction, with colleges, universities and private training firms providing hundreds of Internet-based education options. The development and deployment of this model of education is still in its infancy, and a great deal of research will be required to identify the appropriate and effective use of this technology. Since a significant body of research has already been developed for education in general, the study of Internet-based instruction should be focused on the unique aspects of this medium. One unique aspect of Internet-based instruction is its capability to offer a wide variety of types of instruction on an individualized basis. Theory suggests that adapting instruction to fit student characteristics results in more effective education (Park, 1996), and Internet-based courses offer the opportunity to advance research in this area.

Internet-based Education

The expanding interest in Internet-based instruction makes it an important area of study. In 1998, 60 percent of two-year and four-year education institutions in the US offered courses over the Internet. (Phillips, 1999). Large regional coalitions like Western Governor's University, Southern Regional Electronic Campus and California Virtual Campus offer hundreds of course sections to thousands of students. In private industry, large corporations have established Internet delivery systems to provide corporate training courses to tens of thousands of employees. International Data Corp. predicts that the

Internet will be responsible for increasing the number of distance education students from 710,000 in 1998 to 2.2 million by 2002. This group will represent 15 percent of all higher education students (Rochester, Boggs & Lau, 1999). Given the number of institutions and students expected to participate in Internet-based education, it is important to understand the most effective ways to design and deliver Internet-based courses.

Course Design

A variety of instructional design methodologies have been proposed, but they typically include consideration of instructional strategies, delivery methods, media, and evaluation. Most methodologies also include learner characteristics as an important item to consider in the selection of topics, the order of presentation, and the depth of topic treatment (Kemp, Morrison & Ross, 1998). A vast body of literature has already been published on the design of traditional classroom-based education, and much of this material applies to any course. Rather than duplicate this effort, research on Internet-based courses should focus on the unique attributes of this method of delivery.

The interactivity, multimedia resources, and communication opportunities offered by the Internet provide a diverse set of instructional strategies and delivery methods that are very different from traditional classroom instruction. To advance the design of Internet-based instruction, each of these tools must be understood in terms of the cost to develop and deliver the instruction and the benefit to the student. The diverse media and delivery methods, combined with the time and distance independence of Internet-based instruction also expand the possibilities of designing courses to better meet the

characteristics of individual students.

Learning Styles

Cognitive learning theories suggest that one of the learner characteristics to consider in the course design process is "learning style". A universally accepted definition of learning styles has not been established, but they have been described as the characteristic cognitive, affective, and psychological behaviors that serve as relatively stable indicators of how learners perceive, interact with, and respond to the learning environment (DeBello, 1989). Cognitive theory also suggests Internet-based courses could provide more effective instruction by delivering instructional elements based on students' individual learning styles.

Despite significant research of learning styles and their relationship to student performance, questions remain about whether it is practical to match learning styles to methods of instruction (Kemp, Morrison & Ross, 1998). Reviews of the significant body of literature on this topic in 1979 (Arter & Jenkins), 1993 (Hayes & Allinson) and 1998 (Dillon & Gabbard) found some evidence that learning styles can be matched to specific types of instruction, but no general agreement on this interaction. Hayes and Allinson noted that many studies have investigated the relationship between learning style and achievement, but there have been relatively few studies that have focused on how to match learning styles and methods of instruction. The authors of all three literature reviews noted that the mixed results may have been due to the fact that in many studies, the learning styles identified did not suggest a theoretical preference for the instructional strategies that were tested. Literature suggests that advancement of research in matching

learning styles to methods of instruction requires an instrument that identifies learning styles that can be matched to specific methods of instruction, a medium and delivery method that is capable of delivering a variety of instruction types, and a theoretical link between the learning styles measured and the instruction types.

This study investigated three aspects of Internet-based community college classes; the distribution of learning styles of the students enrolled, student preferences for specific methods of instruction, and the relationship between student learning styles and preferences for methods of instruction. The distribution of student learning styles was measured by the Index of Learning Styles (ILS) (Soloman & Felder, 1999). This instrument is designed for adults and assesses learning preferences on four dimensions that can be theoretically matched to instructional elements in Internet-based courses. A web-based survey designed specifically for this study was used to identify specific methods of instruction provided by these classes, and identify student preferences for these methods of instruction.

Logic suggests that higher student achievement can be attained by using instructional methods that correspond to student learning style preferences. However, prior research has produced mixed results and further study is needed in this area. This study is intended to address that need by exploring the relationship between student learning styles and student preferences for methods of instruction in Internet-based classes. The results of this study might help educators better understand how to address learning styles as a student attribute in designing Internet-based instruction. This study can also provide directions for future research in the area of matching learning styles to

methods of instruction.

Statement of the Problem

Many opinions and documented experiences have been published, but little empirical research exists on student preferences related to the design of Internet-based instruction. The purpose of this study was to gather empirical evidence on student learning styles and student perceptions of Internet-based community college classes. This information could be helpful in the design and delivery of Internet-based college courses.

This study provides descriptive information on the learning styles of students enrolled in Internet-based community college classes, and their perceptions of the helpfulness of 13 possible Internet-based methods of instruction. A correlational analysis was also performed to gather information on the relationship between student learning styles and student preferences for instructional methods in Internet-based community college courses. From a theoretical perspective, this information might be used to advance research in matching learning styles to types of instruction. From a practical perspective, this information might be useful in designing more effective Internet-based instructional materials, and to advise students on the appropriateness of an Internet-based course for their specific learning needs.

Research Questions

In addition to the descriptive and correlational problems addressed above, this study investigated the following research questions:

1. Is there a difference in the distribution of learning styles as measured by the ILS between students in Internet-based community college classes and college

students in general?

2. Is there a difference in the distribution of learning styles as measured by the ILS between students who start Internet-based community college classes and students who successfully complete those classes?

Significance of the Study

Given the resources dedicated to providing courses over the Internet and the number of institutions and students expected to participate in these courses, it is important to understand how to best use the unique attributes of this medium of instruction. A clear understanding of student attributes, and preferences for specific methods of instruction might be used to develop prescriptive theory for the design of Internet-based education. It might also help course developers to focus resources on the elements of a course that students find most helpful. This information may also help instructors and counselors to better meet the needs of students using Internet-based instruction.

One of the key design requirements of any course is an understanding of the attributes of the students participating in a course. This understanding of student attributes allows designers to create materials and methods of instruction that will be most appropriate for the needs and abilities of those students. Information gathered from these research questions might be used to better understand the students participating in Internet-based community college classes. This information might be used in student advisement as well as in the design and delivery of Internet-based courses.

For student advisement, this information could be used to develop guidelines for

students considering Internet-based education. For example, if research indicates students with a specific learning style do not prefer the methods of instruction in an Internet-based class, students who prefer that style could be provided with strategies for dealing with the difficulties they may encounter. These strategies may encourage students to devote extra time to methods that do meet their learning styles, or to supplement their course with outside information or activities. This information may also be useful in pre-screening students whose learning styles may not be compatible with the methods of instruction provided by a specific Internet-based class. These students could be referred to more appropriate options, or provided with additional instructional support to meet their needs.

From a design and delivery perspective, student learning styles information could be used to determine if students in Internet-based courses exhibit specific preferences as a group. Previous learning styles research has indicated that students tend to migrate to academic specializations that emphasize instructional methods that match their preferred learning styles (Kolb, 1976). An understanding of the distribution of student learning styles in Internet-based courses could help course designers and instructors make Internet-based courses more useful to students already participating, and more attractive and accessible to students with a variety of learning styles.

Descriptive information regarding student preferences for methods of instruction might also provide valuable data on the attributes of students participating in Internet-based courses. Most Internet-based courses are self-directed and include a high level of student control. As a result, student preference information might be used by course

designers and instructors in two areas. First, courses that focus on the methods of instruction that students prefer may help improve affective variables, such as motivation, that are critical in this type of instruction (Hiltz, 1994). Second, designers could compare student preferences for specific instructional elements to their own estimates of the cost of developing and delivering those elements. By doing this, developers and instructors might focus their resources on the instructional methods that will be most helpful to the students.

Correlational information about possible relationships between learning styles and Internet-based methods of instruction might be used to advance both theory and practice. From a theoretical perspective, this study will provide information about the possibility of matching student learning styles to Internet-based methods of instruction in community college classes. From a practical perspective, matches between learning styles and preferred methods of instruction might be used to design classes that address the specific learning styles preferences of individual students. The design flexibility provided by an Internet-based course, coupled with the vast amount of information available on the Internet, result in a unique opportunity to create a truly individualized learning environment. In order to create this environment, developers will need a thorough understanding of the attributes of the learners, including their learning styles, and how they interact with the various elements available for delivering instruction over the Internet.

Chapter 2

Review of Related Literature

Overview

The Internet is currently used to deliver a significant amount of adult education and training, and the use of the Internet for instruction is expected to grow dramatically (Rochester, Boggs & Lau, 1999). Internet-based instruction differs considerably from classroom instruction as it provides the opportunity to adapt instruction to individual student characteristics. Adapting instruction to meet the characteristics of individual students is not a new idea, but the Internet may provide new opportunities to advance research in this area. A variety of student characteristics can be used as the basis for individualizing instruction, and since the 1940's, researchers have suggested that learning styles are an important student characteristic (Raynor and Riding, 1997). Despite this long history of study of adapting instruction to learning styles, there is no agreement in the body of literature about its effectiveness.

This chapter summarizes the key elements of literature that relate to the use of Internet-based instruction and its unique attributes. Student learning styles are identified as an important consideration in the design of an Internet-based course, and specific learning style constructs are identified. Research on the relationship between student learning styles and methods of instruction is summarized and problems with past research are identified. Finally, this section identifies the Index of Learning Styles as an instrument that may solve some of the problems identified in previous studies and provides a theoretical link for using it to study the relationship between Internet-based

methods of instruction and student learning styles.

Importance of Studying Internet-based Instruction

The interest in Internet-based instruction can be seen in the number and variety of institutions launching Internet-based courses. Over 60 percent of two-year and four-year education institutions in the US offer courses over the Internet (Phillips, 1999). Western Governor's University, a collaborative effort among institutions from twenty western states, currently offers hundreds of course sections delivered over the Internet (Western Governor's University, 1999). A similar number of courses are also offered by the Southern Regional Electronic Campus, a cooperative effort among sixteen southern states (Southern Regional Electronic Campus, 1999). California Virtual Campus provides access to over 2000 class sections from colleges and universities located throughout California (California Virtual Campus, 2000). It is estimated that over 2.2 million college students will be enrolled in Internet-based courses by 2002. This group will represent 15 percent of all higher education students (Rochester, Boggs & Lau, 1999).

Colleges and universities are not the only institutions using the Internet to deliver education to adult learners. Examples of Internet-based training in private industry include Arthur Anderson's Internet delivery systems for their corporate training courses (Arthur Anderson, 1999) and Boeing's use of Internet-based courses to train over 40,000 employees (Porter, 1999). Other companies like IBM, Novell and Ziff-Davis offer technical training to the public through the Internet.

The use of Internet-based instruction is growing rapidly because it offers institutions the opportunity to reach students who cannot attend traditional classes due to

time or distance constraints. In addition, students with scheduling conflicts can work on Internet-based courses at times that better fit their schedules. These students can use electronic mail, computerized bulletin boards, and chat rooms to communicate with the instructor and other students, either asynchronously or in real time.

Course Design

When designing a course for the classroom or the Internet, the designer attempts to develop an instructional process that will ensure the students achieve the desired level of competency. The systematic method of planning, developing, and evaluating this design process is called instructional design (Kemp, Morrison & Ross, 1998). A variety of instructional design theories have been proposed, and no general consensus has been reached on a single design model. However, most models include identifying the objectives of the course and the content required to meet those objectives. They also typically include consideration of instructional strategies, delivery methods, media, and evaluation. Although the theories are diverse, most also include learner characteristics as an important item to consider in the planning and design of instruction. The characteristics of the learner have implications concerning the selection of topics, the order of presentation and the depth of topic treatment (Kemp, Morrison & Ross, 1998).

In order to provide instruction that is independent of time and location, the design and delivery of Internet-based courses is typically very different from traditional classroom instruction. As a result, much educational research that has focused on classroom-based instruction may not be applicable to the design of Internet-based instruction. Instead, the educational studies that are most appropriate to Internet-based

instruction are those that investigate the distance learning model.

Although the body of research on distance learning is not extensive, Moore and Kearsley (1996) note there is evidence to suggest that "what makes a course good or poor is a consequence of how well it is designed, delivered and conducted, not whether the students are face-to-face or at a distance" (p.6). Based on this idea, research should not be focused simply on whether or not Internet-based instruction can be effective. Instead, research should focus on the unique attributes of Internet-based education and how they can be used effectively.

Design and Delivery Characteristics of Internet-based Instruction

In addition to offering instruction independent of time and place, Internet-based courses offer the opportunity to change the philosophy used in teaching a course. The Internet provides the ability to deliver information in the form of text, graphics, sound, animation and video. The hyperlinking capabilities of the Internet also allow for an almost infinite combination of student control of sequence, pace and even content of the instructional material. Many of the above features have been available to developers of computer based training for years, but the Internet combines these tools with the potential for two-way communication that was previously only available in the classroom. Internet bulletin boards, threaded discussion groups, and electronic mail allow for asynchronous communication among students and instructors. Synchronous communication is also available through chat rooms, instant messaging, and conferencing software. Finally, the Internet provides access to a global data base reflecting a variety of perspectives on almost any topic, and search facilities allow student control of how the information is

accessed. Because the Internet can deliver many forms of instruction on demand, it may offer the first opportunity for truly individualized instruction.

Literature includes a large volume of opinion papers and subjective reviews, but few quantitative studies have addressed the design of Internet-based instruction (Jung, 1999). A study of MBA students in Internet-based classes found flexibility of the medium and the ability to develop an interactive course environment were more important to students than the ease or frequency of use of the medium (Arbaugh, 2000). A survey by Cooper (1999) of student preferences for instructional methods in an Internet-based college course found 95 percent of the students agreed that lecture notes posted on the web were helpful, 73 percent of the students thought discussion groups were helpful and only 57 percent found static slide presentations helpful. In a survey of students enrolled in Internet-based classes at Creighton University, students indicated preferences for discussion groups and on-line schedules, but the results were widely distributed on many methods of instruction (Limbach, Weges & Valcke, 1997). This suggests a possible opportunity to improve Internet-based education by identifying strategies to select instructional methods that fit the needs of individual students.

Adaptive Instruction

The concept of adapting instruction to student preferences is not a new one. Crono and Snow (1986) have traced the concept as far back as the Fourth Century BC. The theoretical relationship between instructional strategies and student characteristics has been termed aptitude-treatment interactions (ATI). Cronbach and Snow (1977) defined treatment as variations in pace or style of instruction and aptitude as any

individual characteristic that increases or impairs the student's probability of success in a given treatment. Interactions may occur in either of two categories of aptitudes: conative and affective, or cognitive. Conative and affective aptitudes include anxiety, achievement, motivation, student interests and self-efficacy. Cognitive aptitudes include intellectual abilities, prior knowledge and cognitive and learning styles (Park, 1996).

Learning Styles as a Construct

Cognitive learning theory suggests that individuals learn by processing information they receive from their senses and past experiences. Under this theory, several authors have proposed that each individual processes information differently. Literature has also proposed that these differences in information processing can be described as learning styles. A universally accepted definition of learning styles has not been established, but they have been described as the characteristic cognitive, affective, and psychological behaviors that serve as relatively stable indicators of how learners perceive, interact with, and respond to the learning environment (DeBello, 1989). In other words, these learning style constructs attempt to describe a person's mode of thinking, remembering or problem solving (Kearsley, 1999).

Although the idea of tailoring instruction to learners' preferences can be traced to ancient Greek literature, Raynor and Riding (1997) believe the idea of learning styles as a construct can be traced to William James' concept of individual differences in the 1890s and Bartlett's research on individual differences in cognition in the 1930s. From the early 1940s through the 1980s, various investigators proposed a variety of style constructs and measurement instruments. In an attempt to organize these constructs into a

comprehensible model, Grigerenko and Sternberg (1995) proposed three distinct traditions of learning styles; (a) the cognition-centered approach, (b) the personality-centered approach, and (c) the learning-centered approach. The cognition-centered approach is concerned with individual differences in cognition and perception, the personality-centered approach is concerned with psychological types and the learning-centered approach is focused on the operational aspects of learning.

Cognition-Centered Learning Styles

Riding and Cheerma (1991) identified 30 different labels for styles that fit within the cognitive group. After reviewing the descriptions, correlations and methods of assessment for each of the dimensions, they proposed two basic cognitive style dimensions; (a) the wholistic-analytic style, and (b) the verbal-imagery style.

The wholistic-analytic style dimension describes an individual's preference for processing information either completely or in parts. Wholistic learners take a global approach. They use overall concepts to make sense of the individual parts. Wholistic learners also tend to absorb material much more randomly. They attempt to grasp the big picture and may be able to find novel ways of solving problems once they have an understanding of the big picture. Analytic learners use a sequential approach. They prefer linear steps that flow in a logical sequence. In solving problems, analytic learners tend to follow a path of logical steps.

The Verbal-Imagery Style dimension describes whether an individual is inclined to represent information during thinking verbally or in mental pictures. This dimension is based on Paivio's (1971) dual coding theory that suggests visual and verbal information

are processed by different cognitive subsystems. As the name suggests, verbal learners process information as words, and imagery learners process information as images and pictures.

Personality-Centered Learning Styles

The Myers-Briggs Type Indicator is the only style model clearly based on the personality-centered approach (Raynor and Riding, 1997). The Myers-Briggs Type Indicator classifies students along four dimensions derived from Jung's theory of psychological types. The first dimension classifies students as extroverts who focus on the outer world, or introverts who focus on the inner world of ideas. The second dimension distinguishes between sensors who are practical, detail oriented and prefer sensory input, and intuitors who are imaginative, concept oriented and rely on intuition. The third dimension identifies thinkers who are logical and skeptical, and feelers who are appreciative and base decisions on humanistic considerations. The fourth scale identifies judgers who set and follow agendas and seek quick closure, and perceivers who adapt to changes and delay closure to gain more information.

Learning-Centered Learning Styles

The learning-centered approach to learning styles research is focused on the impact of individual differences on pedagogy. This approach has generated dozens of proposed dimensions which Raynor and Riding(1997) have organized into three style groups; (a) process-based, (b) preference-based, and (c) cognitive-skills based.

Process-based dimensions describe an individual's preferred process for thinking and activity. These dimensions describe deep or surface thinkers and learners who prefer

either an active or reflective approach to integrating new information.

Preference-based dimensions describe an individual's social preference for collaborative, competitive or individual work. They also describe preferences for the learning setting, including environmental preferences, emotional preferences and preferences for how information is presented. Some instruments in this category also include psychological preferences, such as global or analytic thinking, that overlap with the cognitive-centered approach.

Cognitive skills-based dimensions are the same as the cognitive-centered dimensions above. The only difference is that, in this context, they are viewed from the perspective of their relationship to pedagogy.

Interactions Between Learning Styles and Instruction

Despite the long history of interest in adapting instruction to individual learners and significant work in defining learning styles, questions remain about whether learning styles can be matched to methods of instruction (Kemp, Morrison & Ross, 1998). In a thorough review of the literature in 1979, Arter and Jenkins found no consistent evidence for the idea that learning modalities could be identified in a reliable and valid way that warranted different instructional prescriptions. In a more recent review of 17 studies, eight of the studies supported the idea that matching instructional strategies with learning styles could be effective. Two of the 17 studies also provided partial support for this concept, with correlations shown on one of the dimensions measured (Hayes & Allinson,1993). The authors suggest the studies that did not show support for this matching hypothesis might have lacked a significant interaction between the cognitive

styles they measured and the teaching methods they evaluated. They also note that many studies have investigated the relationship between learning style and achievement, but there have been relatively few which have focused on the interaction of learning styles and instructional strategies. Although Haynes and Allinson did find some support for matching strategies, their conclusions were similar to Arter and Jenkins above.

In a review of research comparing learning styles in hypermedia and non-hypermedia environments, Dillon and Gabbard (1998) also found mixed results. The studies reviewed dealt primarily with the variable of field independence/dependence and only one of four studies reviewed showed a significant effect for learning styles. The authors noted that there is some evidence that learning styles may be an important variable in researching hypermedia instruction, but field independence/dependence may not be the appropriate dimension to measure. They suggested continued research with other style dimensions that show greater potential for predicting behavior and performance. In a study supporting this idea, Liu and Reed (1994) found that students with different learning styles did demonstrate differences in the way they accessed functions in a hypermedia environment.

Very little quantitative research specific to learning styles and Internet-based methods of instruction has been published (Jung, 1999). In a study investigating the relationship between student learning styles and the learning strategies they employed in an Internet-based course, no significant relationship was identified (Shih, Ingebritsen, Pleasants, Flickinger, & Brown, 1998). This study used the field dependence/independence learning style and attempted to find relationships to students'

preferences for memorization or other learning strategies that were not related to methods of instruction. Fedirco's (2000) study of postgraduate students did find a relationship between students' general opinions of Internet-based instruction and learning styles measured by Kolb's Learning Styles Index. This study did not focus on specific methods of instruction, but it found that students with assimilating and accommodating learning styles demonstrated significantly more agreeable attitudes toward the design and use of network-based instruction than students with converging and diverging learning styles. In another study, Limbach, Weges and Valcke (1997) found that 75% of the students in Internet-based classes at The Open University prefer a deductive learning mode that starts with a theory and moves toward practical examples and implementations of that theory. They did not test for specific learning style types, but this learning preference is typically associated with reflective learners, similar to the assimilating style (Kolb, 1976) that Federico (2000) found most agreeable to network-based instruction.

Learning Styles Instruments

The conclusions reached in most of these studies indicate advances in this area of study require measurement of learning styles in a manner that has a theoretical correspondence to specific instructional strategies. This requires a measurement instrument that identifies the most appropriate learning styles, a set of instructional treatments that can be linked to those styles through cognitive theory, and a reasonable method for delivering the instructional treatments based on learning preferences.

As noted previously, dozens of instruments have been developed to measure learning styles. A complete review of learning styles instruments is beyond the scope of

this project, but DeBello (1989) provides a review of eleven of the most popular learning styles measures. In his review, DeBello notes that most learning styles instruments offer relatively low levels of validity. Since test validity is a function of the use of the test, it may be that these most popular measures do not measure dimensions in a manner that corresponds well with the achievement or instructional processes that have been studied. In determining the validity of a learning styles instrument, the emphasis should be on the theoretical correspondence between the instrument items and the specific constructs the instrument will be used to test. (Riechmann & Grasha, 1974). For example, a test of cognitive style preferences may not measure constructs that are useful in comparing student achievement. However, this does not mean the instrument itself is invalid. As Hayes and Allinson's (1993) suggest, these instruments may define constructs that are more appropriate for measuring other student behaviors, such as preferences for methods of instruction.

Expanding on this idea, Rayner and Riding(1997) suggest that what is needed to advance research in matching learning styles and instructional strategies is an instrument that is basic, focusing on primary features of an individual's learning styles. It should be manageable, accessible, and geared to the real world of education and training. It should also be linked to an assessment procedure that is easy for both students and instructors to use.

Index of Learning Styles

The Index of Learning Styles (ILS) (Soloman & Felder, 1999) may be a useful tool in solving the problems noted above. The ILS is an instrument that measures adult

learning preferences across four separate dimensions; active/reflective, sensing/intuitive, visual/verbal and sequential/global. As with most learning styles indicators, the dimensions are not mutually exclusive. Each learner uses both sides of each dimension in the course of learning. However, given the choice, each student has preferences for the modes they use to learn. The ILS attempts to measure these preferences through a 44 item survey. The survey provides 11 dichotomous choices for each dimension. Each of the 11 items for a dimension describes a different learning situation that applies to that dimension. The instrument yields four scores for the student, one for each learning dimension. The scores indicate the student's preferences on that single dimension, and there is no attempt to relate the scores from one dimension to any other dimension. The complete ILS and scoring procedures are included in appendix B.

Active/Reflective Dimension

This dimension of the ILS measures student preferences for experimentation, participation and internal reflection. Active learners prefer to try something first and view the consequences, while reflective learners prefer to think a problem through before attempting it. Active learners are also more likely to prefer group work, while reflective learners prefer to work alone. This dimension is part of the activity or learning-centered approach to learning styles (Rayner and Riding, 1997). As defined in this instrument, it includes both process-based elements and preference-based elements. The ILS attempts to measure the process-based elements of activity or reflective observation as well as the preference-based social elements of group or individual work.

Most research on matching this dimension to instruction has been conducted using

instruments including those developed by Kolb (1976) and Honey and Mumford (1986). Hayes and Allinson (1993) cited four studies that supported matching this dimension with specific methods of instruction, and two that did not. The lack of strong support for matching on this dimension may be due to the way it is measured by both Kolb and Honey and Mumford. Both of these instruments use a two dimensional scale that relates the active/reflective dimension to another dimension called concrete/abstract. For a learning style measure to possess construct validity, the learning style dimensions should be independent of one another (Riding, 1997). The mixing of these dimensions may have distorted the results.

Sensing/Intuitive Dimension

This dimension is based on Jung's theory of psychological types. Under this theory, sensing learners prefer information that comes to them directly through their senses, while intuitive learners prefer information that comes from internal reflection and imagination. Sensing learners prefer to learn from specific facts, while intuitive learners prefer to discover possibilities and relationships. Sensing learners like to use well established rules to solve problems and are good at memorizing facts and doing hands-on work. Intuitive learners are impatient with rules and prefer to discover new methods for solving problems. They also prefer abstractions and equations to lab experiments. This dimension is part of the personality-centered approach to learning styles (Rayner and Riding, 1997), and is also measured by the Myers-Briggs Type Indicator (Myers, 1978). Little educational research has been documented on matching personality-based measures with methods of instruction.

Visual/Verbal Dimension

As the names imply, visual learners prefer to see things like diagrams, pictures, films, and flowcharts. Verbal learners prefer words, either written or spoken explanations. This dimension is based on Paivio's (1971) dual coding theory. The dual coding theory suggests that visual and verbal information are processed by different cognitive subsystems. It is also based on research conducted by Dunn and Dunn (1978) that indicates people do have a preference for receiving information either visually or verbally. The visual/verbal learning styles dimension can be categorized as a cognition-centered style (Raynor and Riding, 1997).

In addition to the research of Dunn and Dunn that provided evidence for the validity of the visual/verbal construct, several studies have provided support for the benefits of matching instruction to this learning style. Studies by Riding and Ashmore (1980), Riding and Douglas (1993), Riding and Dyer (1980) and Douglas and Riding (1994) have provided evidence for higher achievement levels when instructional strategies are matched to students' preferences on the visual/verbal construct.

Sequential/Global Dimension

This dimension deals with a student's preference for the structure of the learning experience. It is a cognition-based style and is also known as wholistic/analytical or serialist/holist. The roots of this construct have been traced to Pask's (1975) conversation theory. Sequential learners absorb information and acquire understanding of material in small connected chunks. Global learners absorb information in seemingly unconnected

fragments and achieve understanding in large holistic leaps. Sequential learners can solve problems with an incomplete understanding of the material and their solutions are generally orderly and easy to follow. However, they may lack a grasp of the broad context of a body of knowledge and its interrelationships with other subjects and disciplines. Global learners work in more of an all-or-nothing fashion and may appear slow and do poorly on homework and tests until they grasp the total picture. However, once they have it, global learners can often see connections to other subjects that escape sequential learners.

Research on the interaction between a student's position on the sequential/global dimension and performance has produced mixed results. Douglas and Riding (1994) found a significant interaction for 11 year old students. However, a review of seven studies using a variety of measures of this construct revealed only two studies that produced significant support for matching on this construct (Hayes and Allison, 1993). The authors suggest that the studies that did not find an interaction may not have been based on an adequate theoretical linkage between the style measured and the instructional strategy tested.

ILS Summary

As noted above, one of the difficulties with learning styles research has been identifying learning styles in a valid way that corresponds to specific instructional strategies. The ILS may solve part of this problem because it meets many of the criteria proposed by Rayner and Riding (1997). The ILS is focused on primary features of an individual's learning styles and includes key elements from all three approaches to

learning styles. The ILS dimensions are geared to the real world of education and training and relate well to methods of instruction. The ILS assessment procedure is easily understood by college students and the scoring can be automated. This instrument is also easily accessible, as the authors have made it freely available for research purposes.

Instructional Methods

The second key element in attempting to match learning styles and instructional methods is a set of methods that can be theoretically linked to the learning styles measured. One of the major difficulties with the early research in this area has been the practical issue of addressing individual learning styles in the group instruction format of a traditional classroom. Some approaches to dealing with this problem are similar to the Keller plan of the mid-sixties, which divided curriculum into units and required mastery of one unit before proceeding to the next (Park, 1996). This plan allowed for individual pace, but relied primarily on texts as sources of information, and did not really attempt to tailor instructional resources to different learning styles.

Other approaches are similar to the 4Mat approach, which recognizes that students have different learning styles, but does not identify individual student preferences (Leflar & McCarthy, 1983). Instead, it attempts to provide redundant or relevant information in formats that accommodate each of four different learning styles. The theory of this model is that by addressing all four learning styles, everyone in the group will get at least part of the information in a format that fits their learning style preference.

Although these approaches may be reasonable for group instruction, they fail to provide truly individualized instruction. Educational technologists have theorized about

the possibility of using computer technology to provide this individualized instruction for decades (Park, 1996). Computer-based instruction can deliver materials using a variety of media and can provide learner control through hyperlinks. It can also be interactive, and adapted to the individual learner. Internet-based instruction includes these capabilities and adds the ability to communicate directly with peers and the instructor. The flexibility and features offered by Internet-based instruction make it possible to adapt instruction in a variety of ways to match student learning styles.

Internet-based Instructional Methods Corresponding to ILS Styles

Given the tools available for adapting Internet-based instruction to match learning styles, successful matching requires a theoretical link between the measured style and the instructional adaptation. The ILS positions students on four separate learning styles dimensions, and literature has identified instructional strategies with a theoretical linkage to each of these dimensions. Most of these strategies have been identified for a classroom teaching environment that requires including a mix of all styles. However, Internet-based instruction can provide these same instructional techniques on an individualized basis.

Active Learners

Active learners tend to retain and understand information best by doing something active with it. This includes applying the concept to an activity, or discussing the concept with others (Felder and Solomon, 1999). Based on this profile, an Internet-based course offers several options that match the style of active learners.

An Internet-based course can meet the active learner's preference for group work and communication through chat rooms, discussion groups and meeting software. Chat

rooms can provide the student an opportunity to exchange typed messages in real time with classmates and the instructor. Conferencing software can expand this concept and allow verbal or video discussions and a shared work space for writing ideas.

Because it is not always possible to meet at the same time for chat or conferencing, active learners can also engage in conversation using threaded discussion groups. These groups allow participants to exchange ideas by posting messages organized by topic. Students can read and respond to the posted messages at any time.

Internet-based courses can also contain elements that match the active learner's preference for applying concepts to an activity. As with other computer based instruction, Internet-based courses can provide simulations of activities and experiments. Students can also apply the concepts by working through practice quizzes that test their knowledge of the topic. Finally, active students may benefit from following links to gather information from a variety of sources.

Reflective Learners

These learners do much of their processing introspectively. They prefer to think through a problem before experimenting with it. They also prefer to work alone (Felder and Solomon, 1999).

The general self-pacing aspect of an Internet-based course matches this learning preference well. Students are allowed to work through material at their own pace, and pause for reflection as needed. Students are also able to work alone. If the class requires discussion, reflective students still have the opportunity to formulate their ideas on their own, before participating in discussion. However, reflective learners are less likely to

want to participate in discussion.

Sensing Learners

Sensing learners (sensors) favor information that comes directly from their senses over information that comes from imagination or memory. They tend to be very practical and like facts and observations. Sensors also like well-defined procedures. They tend to be careful, and do not object to detailed or repetitive work (Felder and Solomon, 1999).

In an Internet-based class, sensors would prefer a simple, direct presentation of the facts. This may include text, images, or dialog with other participants. The key element for sensors is a well-defined procedure for completing the course requirements. Sensors are likely to benefit from a detailed schedule and sequential instructions. They are not likely to find optional resource links or unstructured exploratory exercises beneficial.

Intuitive Learners

Intuitive learners (intuitors) favor discovery, imagination and internal reflection. Intuitors prefer concepts and interpretations to details and facts. They are comfortable with complexity and can become bored with too much detail or repetition (Felder and Solomon, 1999).

Intuitors are likely to prefer the opportunities for exploration provided by an Internet-based course. Intuitors could benefit from links to sites presenting potential applications of the course facts, or directory sites that allow the student to explore the topic from a variety of perspectives. The self-pacing aspect of an Internet-based course can allow the intuitor to explore these resources as much as he or she desires.

Visual Learners

Visual learners get more information from images than from verbal material. They prefer pictures, images, diagrams and demonstrations. The multimedia capabilities of an Internet-based course provide at least two strategies for matching this learning preference. First, static pictures, graphs or animations can be used to provide visual representations of information. Second, video clips or video conferencing can be used to demonstrate activities and procedures.

Verbal Learners

Verbal learners prefer presentations that use words instead of images. Research has shown that both text and auditory input are processed in a similar manner, so verbal learners would have a preference for both written and oral descriptions of the material (Paivio, 1971). Internet-based courses can provide information in both of these formats. Web pages can include printed text as well as pre-recorded or live audio broadcasts.

Sequential Learners

Sequential learners tend to acquire information in linear steps that follow in a logical progression. They also tend to gain information in small chunks, and may not understand the relationships between individual chunks or topics (Felder and Solomon, 1999).

Students who prefer a sequential style are likely to benefit from an Internet-based course with a detailed schedule that structures the course as a series of sequential steps. They may also benefit from a structure that demonstrates the logical flow between individual course topics. Sequential learners are less likely to benefit from exploratory

activities or links.

Global Learners

Students with this learning preference follow an almost random sequence through material, often without understanding connections. At some point they achieve understanding in holistic leaps, when they suddenly see the connections (Felder and Solomon, 1999). They are likely to benefit from exploratory links that provide practical examples of course material to help them make connections. They are also likely to benefit from creative activities that allow them to identify how the pieces of information fit together. Creating a map or diagram showing the relationship of the course topics is an example of this type of activity (Pompilio, 1999)

Distribution of College Students' Learning Styles Scores

Although the ILS has been used in studies of engineering students (Rosati, 1998, Montgomery, 1995, and Curtis & Howard, 1999), the learning styles distributions from these are not likely to be representative of the distribution of learning styles among college students in general. Kolb (1976) found there were differences between learning styles scores for various college majors. Because of this, the learning styles distributions found in other ILS studies cannot be considered representative of all community college students.

Other studies provide some evidence of how learning styles are distributed among college students in general. In a study of 18,592 college students, Myers and McCaulley (1985) found 60 percent of the students were sensors as measured by the Myers-Briggs Type Indicator. In an analysis of 298 college student scores from several separate studies,

Kolb (1976) found 62% of the students preferred active learning and 38% preferred *reflective* learning as measured by Kolb's Learning Styles Index. He also found that the preference for active learning increased as students attended more post-secondary courses. No widely recognized studies are available to provide information on the distribution of college student learning styles among the sequential/global and visual/verbal dimensions of the ILS.

Summary

This section summarized literature that provides a theoretical foundation for the study of Internet-based methods of instruction, student learning styles and correlations between learning styles and methods of instruction. The significance of Internet-based instruction in adult education was noted and the unique attributes of Internet-based classes were described. A theoretical foundation for adapting instruction to learner characteristics was presented and specific learning styles were identified as learner constructs. Conflicting research results from attempts to adapt other types of instruction to learning styles provided evidence of the need for further research in this area. Theoretical and methodological issues were identified as possible reasons for the inconsistent research results. These issues were summarized as the lack of the ability to measure learning styles in a manner that could prescribe specific instructional techniques. The Index of Learning Styles (ILS) was described as an instrument for measuring learning styles that have a theoretical connection to specific Internet-based methods of instruction.

Internet-based courses are becoming an increasingly popular medium for

delivering adult education and training in both academia and private industry. These Internet-based courses offer a significantly different teaching environment that includes multiple media formats, synchronous and asynchronous communication and a high level of student control. This teaching environment provides the ability to offer greater individualization of instruction than was possible in classrooms or traditional computer-based instruction. This opportunity for greater individualization, combined with its rapidly growing use, make Internet-based instruction an important topic for scientific investigation.

The scientific study of aptitude-treatment interaction (ATI) includes the study of variations in styles of instruction and their interactions with student learning styles. A large and diverse set of learning styles have been identified by a variety of authors. These learning styles were categorized and their theoretical background was presented as evidence of the validity of specific learning styles as constructs.

Interactions between learning styles and types of instruction have been studied since the 1940's with mixed results. Reviews of the significant body of literature on this topic in 1979, 1993 and 1998 found some evidence that learning styles can be matched to specific types of instruction, but did not find general agreement on this interaction. The authors of all three literature reviews believe the mixed results were a result of learning styles that were not identified in a valid way that corresponded to specific instructional strategies. In combination, these literature reviews suggested three elements were required to significantly advance the study of interactions between learning styles and types of instruction. These elements are; (a) a measurement instrument that identifies

learning styles directly related to the instruction process, (b) the ability to provide individualized instruction using a variety of types of instruction, and (c) a theoretical correspondence between the learning styles measured and the types of instruction provided.

Literature suggests an appropriate instrument for measuring learning styles should focus on primary features of learning styles that are geared toward the real world of education and training. The instrument should also be easy for both students and teachers to use. The Index of Learning Styles (ILS) is an instrument that meets this criteria. The ILS includes dimensions from all three major categories of learning styles and the dimensions are directly related to the process of education and training.

Internet-based courses provide the ability to implement types of instruction that have a theoretical correspondence to the dimensions measured by the ILS. Variations in media, prompts and student control can be used to adapt courses to provide instruction to the style preferred by each student.

As a result, the ILS and Internet-based instruction may provide tools that can advance the study of the relationship between learning styles and types of instruction. A better understanding of this relationship can be used to improve the effectiveness of Internet-based courses. This study provides information on student learning styles, student preferences for methods of instruction and the relationship between learning styles measured by the ILS and students' preferences for Internet-based methods of instruction.

Chapter 3

Methodology

Overview

This study describes attributes and preferences of students enrolled in Internet-based classes offered by Nevada community colleges during the 1999-2000 academic year. The study investigated students' learning style preferences and their opinions of various elements of Internet-based courses through a pilot study in the Spring 2000 semester and a final study in the Fall 2000 semester. It also investigated relationships between student learning styles and perceived helpfulness of methods of instruction. This section provides descriptions of (a) the research problem, (b) the research questions and hypothesis, (c) the participants and setting, (d) the data collection instruments and procedures, and (e) the data analysis procedures.

Research Problem

The Internet is a popular medium for delivery of instruction and the methods for delivering this instruction are very different from the methods of delivering instruction in a typical classroom. The cost and technical difficulty associated with delivering various methods of instruction can vary widely. Students' perceptions and use of the instructional methods can also vary. This study provides information about students' opinions of the helpfulness of instructional methods provided in an Internet-based course. Student learning style information was also collected and the relationship between learning styles and student perceptions of the effectiveness of Internet-based methods of instruction was investigated. This information might be used to design classes that better

fit the learning style preferences of community college students. It might also be used to develop advisement procedures for students on the appropriateness of an Internet-based course for their needs. By addressing these learning style preferences in course design and advisement, community colleges may be able to improve student satisfaction and success rates in their Internet-based classes.

Research Questions and Hypothesis

In addition to the descriptive and correlational problems addressed above, this study investigated the following research questions:

1. Research Question 1

   Is there a difference in the distribution of learning styles as measured by the ILS between students in Internet-based community college classes and college students in general?

Psychometric normative data have not been published for the ILS, but findings from previous studies described in chapter 2 indicate theoretical distributions of college student learning style preferences as 62% active and 38% reflective (Kolb, 1976), and 60% sensing and 40% intuitive (Myers and McCaulley, 1985). As a result, the following research hypotheses were developed to investigate this research question:

H_0(a): The distribution of learning style preferences of students in Internet-based community college classes as measured by the ILS is 62% active and 38% reflective.

H_1(a): The distribution of learning style preferences of students in Internet-based community college classes as measured by the ILS is not 62% active and 38%

reflective.

H_0(b): The distribution of learning style preferences of students in Internet-based community college classes as measured by the ILS is 60% sensing and 40% intuitive.

H_1(b): The distribution of learning style preferences of students in Internet-based community college classes as measured by the ILS is not 60% sensing and 40% intuitive.

Research Question 2

2. Is there a difference in the distribution of learning styles as measured by the ILS between students who start (final study) Internet-based community college classes and students who successfully complete (pilot study) those classes?

A pilot study found that the majority of students completing an Internet-based class preferred the reflective (54.4%), sensing (75.4%), visual (70.1%) and sequential (68.4%) learning styles. Although psychometric normative data are not available for this instrument, past studies by Kolb (1976) and Myers and McCaulley (1985) indicate the percentages found for reflective and sensing learners are not typical for college students in general. Based on these skewed distributions, it was hypothesized that students with specific learning styles may be more likely to complete an Internet-based course. If this is the case, community colleges may be able to reduce dropout rates in Internet-based classes by providing instruction that better meets student learning style preferences, or advisement on the appropriateness of Internet-based instruction for students with specific learning styles. As a result, the following hypotheses were developed to compare the

learning styles distribution of students in the final study to the specific distributions found in the pilot study:

H_0(c): The distribution of learning styles of community college students who enroll in Internet-based classes is 16% strong to moderate active, 30% moderate to slight active, 42% moderate to slight reflective, and 12% strong to moderate reflective as measured by the ILS.

H_1(c): The distribution of learning styles of community college students who enroll in Internet-based classes is not 16% strong to moderate active, 30% moderate to slight active, 42% moderate to slight reflective, and 12% strong to moderate reflective as measured by the ILS.

H_0(d): The distribution of learning styles of community college students who enroll in Internet-based classes is 75% sensing and 25% intuitive as measured by the ILS.

H_1(d): The distribution of learning styles of community college students who enroll in Internet-based classes is not 75% sensing and 25% intuitive as measured by the ILS.

H_0(e): The distribution of learning styles of community college students who enroll in Internet-based classes is 69% sequential and 31% global as measured by the ILS.

H_1(e): The distribution of learning styles of community college students who enroll in Internet-based classes is not 69% sequential and 31% global as measured by the ILS.

H_0(f): The distribution of learning styles of community college students who enroll in Internet-based classes is 33% strong to moderate visual, 37% moderate to slight

visual, 23% moderate to slight verbal, and 7% strong to moderate verbal as measured by the ILS.

$H_1(f)$: The distribution of learning styles of community college students who enroll in Internet-based classes is not 33% strong to moderate visual, 37% moderate to slight visual, 23% moderate to slight verbal, and 7% strong to moderate verbal as measured by the ILS.

The Participants and Setting

This study investigated the attributes and opinions of students enrolled in Internet-based courses offered through the four community colleges in the University and Community College System of Nevada. These colleges include The Community College of Southern Nevada (CCSN) in Las Vegas, NV., Great Basin College (GBC) in Elko, NV., Truckee Meadows Community College (TMCC) in Reno, NV., and Western Nevada Community College (WNCC) in Carson City NV. These courses were identified through each institution's web site. This study was concerned with the methods of instruction that could be delivered using the Internet, so courses that included a broadcast television element were excluded. The pilot study included 71 courses from nine different academic areas and the final study included 76 courses from 15 different academic areas. The average enrollment in these courses was 25 students. Appendix A includes a complete list of the courses included in both studies.

Data for the pilot study was collected during the last two weeks of the Spring 2000 semester to provide students with enough experience to be able to evaluate the methods of instruction. The response rate to the pilot study was very low, with only 57

students responding from 18 of the 71 classes. Follow up phone calls to several instructors revealed that the low response rate might due to the number of students who had dropped from the classes, and the fact that students were too busy with final exams to participate. Based on this feedback, the final study was issued during the third through sixth week of the Fall 2000 semester. This time frame was chosen to capture student information before a significant number of dropouts occurred. It was also not a time period when large exams are assigned.

The invitations to participate in the studies were sent via electronic mail to the instructors responsible for teaching the Internet-based classes. These e-mail messages requested that the instructors forward the survey to their students through e-mail or electronic bulletin board. In addition to the e-mail requests, telephone calls were placed to each of the instructors requesting their participation.

For both studies, the e-mail invitation to students included a unique World Wide Web URL for the data collection instrument for their course. The unique URLs were used to identify responses by their institution and course number. They were also used to limit the possibility of random web browsers finding the survey and submitting a response. A sample of the invitation to participate is provided in appendix C.

Data Collection Instruments and Procedures

Data for this study was gathered with a questionnaire delivered over the Internet. The questionnaire consisted of three main parts; (a) a demographics section, (b) an instructional methods section, and (c) a learning styles section. An example of the web pages that were used to deliver the questionnaire is available on the Internet at

134.197.14.165/survey and is also provided in appendix B.

The demographics section of the survey collected data that can be used to better understand the attributes of the typical student participating in these Internet-based courses. Ages, gender and educational backgrounds were collected to better identify the population described in this study. The demographics section also asked participants to state how many Internet-based courses they had completed.

Learning style data was collected using Soloman and Felder's (1999) Index of Learning Styles Questionnaire. This instrument was chosen primarily because it fit the criteria proposed in literature for a measurement instrument that is useful in matching learning styles to methods of instruction. Specifically, this instrument is basic, focusing on primary features of learning styles from all three learning styles traditions. The learning styles measured are geared toward the instructional process and can be linked through theory to specific methods of instruction. As an Internet-based instrument, it is easy for both students and instructors to use. This instrument was also designed for college students and is written in terms that are easily understood by this audience. The final consideration in choosing this instrument was that it is freely available for use by researchers.

It should be noted that validity and reliability data for the Index of Learning Styles is not currently available. The authors of the instrument have indicated the internal reliability of the questionnaire has been tested using the split-half method and found to be adequate, but specific results have not been published. A split-half reliability procedure was used to test the internal reliability of the instrument within the context of this study.

The Spearman-Brown correction formula was used to adjust the scores for test length and the resulting reliability coefficient was .73. Although this internal reliability level is relatively low, it is not uncommon for learning styles instruments. DeBello (1989) found that many learning styles instruments suffer from unknown or relatively low levels of reliability.

The content validity of the ILS is based on the expert review of the test authors and is corroborated by theoretical support of the test dimensions in literature. The results of this study address the concurrent validity of the ILS and students' preferences for Internet-based methods of instruction.

A questionnaire designed specifically for this study was used to gather data on student preferences for Internet-based methods of instruction. This questionnaire asked participants to evaluate the following Internet-based methods of instruction:

1. Text Presentations. This means web pages that only include lecture notes or text (words only) material. These pages are similar to book pages. This is a basic element of all Internet-based courses.

2. Pictures, Graphics and Animations. This includes the graphical elements of the course including photos, drawings, charts and diagrams, and illustrations. It also includes animated images. It does not include video or movie presentations.

3. Course Map. A course map, or site map, organizes all of the course resources on a single page. It typically provides a structure to show how the various parts of the course relate to each other.

4. Schedule and Detailed Course Instructions. Detailed course instructions

could include a description of the specific sequence students should follow while working on the course. The schedule includes either suggested or required completion dates for course assignments and activities.

5. Optional Links for Exploration. These links are not required as part of the course information. They provide access to Internet sites that are related to the course material and allow students to explore topics beyond the scope of the class.

6. Threaded Discussion. This allows students to communicate with the instructor and classmates in writing, using an Internet newsgroup or bulletin board service.

7. Real Time Chat. This allows students to communicate with other class members and the instructor in writing, using an Internet chat service. It may be one-to-one communication, or several students and the instructor.

8. Audio Presentations. These presentations are similar to a course lectures. They may be live or pre-recorded. They may include voice, music or other sounds and may be accompanied by slides or text pages that provide an outline of the topic. If the presentation is live, students may be able to respond through a chat or e-mail function.

9. Video Presentations. These presentations are similar to a television broadcast. They may be live or pre-recorded. They can include lectures, or video or movie clips relevant to the course. If the presentation is live, students may be able to respond through a chat or e-mail function.

10. Live Audio/Video Conferencing. This is a live, two-way audio or video

communication feature. These conferences require all participants to be on-line at the same, predetermined time.

11. Interactive Problems or Activities. These are interactive exercises that require the student to enter some type of response. The program then responds based on the student's input. They include simulations, or text-based exercises and quizzes.

12. Instructor Control of your Computer. This design element allows the instructor to view and manipulate the display shown on the student's computer. It is implemented through software similar to Microsoft's Net Meeting, and allows the instructor to guide the student through specific computer tasks.

13. E-mail. This allows direct and private written communication with the instructor or classmates.

An almost infinite number of specific instructional possibilities exist, but these methods of instruction were chosen because they provide comprehensive coverage of the categories of instruction that can be delivered over the Internet. The participants were provided with the above descriptions as a supplement to help them categorize the methods of instruction available in their courses.

The instructional methods section of the questionnaire asked students three questions about each method of instruction. First, students were asked whether or not it was available in their course. If it was available, they were asked to rate both the quality and the effectiveness of the method of instruction. Because the quality of the method may affect the students' rating of effectiveness, the two scales were presented together to

encourage respondents to differentiate between helpfulness and quality. An eight point, forced choice Likert scale was used to evaluate each element.

The combined instrument containing the instructional methods questionnaire and the Index of Learning Styles questionnaire was tested on approximately 25 students in a single Internet-based course. Thirty-two percent of the students responded to the instrument test. Minor technical problems were identified in the scoring during the first stage of the test, and they were corrected before the test was completed.

Data Analysis Procedures

Descriptive statistics were used to analyze the demographic data. The range and mean of student ages was calculated, along with frequencies for student gender. Educational background is reported in categories and the mode is identified.

Index of Learning Styles data is also reported using descriptive statistics. Scores for each learning style dimension were categorized and the frequencies for each category were determined. A one-sample Chi-square test was used to compare the distribution of learning styles scores from the final study to theoretical distributions for college students in general. A one sample Chi-Square test was also used to compare the distribution of learning styles scores from the final study to the distribution predicted by the pilot study. This method was selected because direct comparison of the results of the two studies was not possible. The studies could not be viewed as independent samples, since the final study included students who would eventually complete the course.

Descriptive statistics for methods of instruction include the number of courses that used each method, and the median, mean and standard deviation of perceived course

helpfulness ratings. The range, median, mean ranking, and standard deviation are reported for both the helpfulness and the quality of each method of instruction. In addition, the helpfulness ratings were related to the quality ratings using the Spearman Rank Correlation Coefficient to determine if students were differentiating between the two questions.

Data on the relationship between learning styles and design elements was analyzed using a Spearman Rank Correlation Coefficient correlation matrix. An experiment-wise alpha of .05 was used, and the Bonferroni correction was used to establish the appropriate procedure-wise alpha.

Limitations of the Study

The primary limitation of this study is the bias introduced by voluntary participation. Voluntary participation was chosen because it allowed for responses from a more diverse set of courses. However, the results may not be representative of the entire population. This study was also limited to community college students in the University and Community College System of Nevada. Community college students are often part-time students, and may not be seeking a degree. There are also typically fewer restrictions to enrolling in community college courses. Therefore, the results may not apply to all levels of college instruction. Finally the number of responses received was a relatively small percentage of the total students enrolled in Internet-based classes.

This study was also limited by the instrumentation. The results indicated that the custom questionnaire did not adequately control for confounding variables that affected student helpfulness ratings. Specifically, helpfulness ratings for methods of instruction

appear to have been influenced by the quality of the implementation, and the students' overall impression of the class.

Comparison of the distribution of the respondents' learning styles was limited by the lack of psychometric normative data for the ILS. Finally the learning styles distributions of the pilot study and the final study could not be compared directly, because they could not be considered independent samples.

Summary of the Methodology

This study used descriptive and correlational analysis to identify student learning styles and perceptions of Internet-based methods of instruction. The distribution of student learning styles was examined with one-sample Chi-Square tests. The relationship between student learning styles and helpfulness ratings for methods of instruction were calculated using the Spearman Rank Correlation Coefficient. The inter-item consistency of the Index of Learning styles was examined with a split-half reliability test. The population of the study was limited to volunteer students in Internet-based courses offered by the four community colleges in the University and Community college system of Nevada and the response rate was relatively low. The instrumentation also limited the ability to control for confounding variables in the helpfulness ratings for methods of instruction.

Chapter 4

Results

Overview

This chapter describes the results obtained from the questionnaire as well as telephone interviews and e-mail correspondence with participating instructors. The chapter organizes the results into three sections and concludes with the limitations of the study and a summary of the results. The first section describes the response rate and demographics of the respondents. The second section reports the descriptive and correlational data for perceived helpfulness of Internet-based methods of instruction, The third section of results addresses the following research questions and hypotheses:

1. Research Question 1

   Is there a difference in the distribution of learning styles as measured by the ILS between students in Internet-based community college classes and college students in general?

   Psychometric normative data have not been published for the ILS, but findings from previous studies described in chapter 2 indicate theoretical distributions of college student learning style preferences as 62% active and 38% reflective (Kolb, 1976), and 60% sensing and 40% intuitive (Myers and McCaulley, 1985). As a result, the following research hypotheses were developed to investigate this research question:

H_0(a): The distribution of learning style preferences of students in Internet-based community college classes as measured by the ILS is 62% active and 38% reflective.

H_1(a): The distribution of learning style preferences of students in Internet-based community college classes as measured by the ILS is not 62% active and 38% reflective.

H_0(b): The distribution of learning style preferences of students in Internet-based community college classes as measured by the ILS is 60% sensing and 40% intuitive.

H_1(b): The distribution of learning style preferences of students in Internet-based community college classes as measured by the ILS is not 60% sensing and 40% intuitive.

Research Question 2

Is there a difference in the distribution of learning styles as measured by the ILS between students who enroll in Internet-based community college classes and students who successfully complete those classes?

H_0(c): The distribution of learning styles of community college students who enroll in Internet-based classes is 16% strong to moderate active, 30% moderate to slight active, 42% moderate to slight reflective, and 12% strong to moderate reflective as measured by the ILS.

H_1(c): The distribution of learning styles of community college students who enroll in Internet-based classes is not 16% strong to moderate active, 30% moderate to slight active, 42% moderate to slight reflective, and 12% strong to moderate reflective as measured by the ILS.

H_0(d): The distribution of learning styles of community college students who enroll in

Internet-based classes is 75% sensing and 25% intuitive as measured by the ILS.

H_1(d): The distribution of learning styles of community college students who enroll in Internet-based classes is not 75% sensing and 25% intuitive as measured by the ILS.

H_0(e): The distribution of learning styles of community college students who enroll in Internet-based classes is 69% sequential and 31% global as measured by the ILS.

H_1(e): The distribution of learning styles of community college students who enroll in Internet-based classes is not 69% sequential and 31% global as measured by the ILS.

H_0(f): The distribution of learning styles of community college students who enroll in Internet-based classes is 33% strong to moderate visual, 37% moderate to slight visual, 23% moderate to slight verbal, and 7% strong to moderate verbal as measured by the ILS.

H_1(f): The distribution of learning styles of community college students who enroll in Internet-based classes is not 33% strong to moderate visual, 37% moderate to slight visual, 23% moderate to slight verbal, and 7% strong to moderate verbal as measured by the ILS.

Survey Response and Demographics

Responses were received from 24 of the 52 invitations sent to instructors. This was a 46 percent participation rate for the instructors. Table 1 shows that the instructors who participated offered classes in 15 different subject areas. This was considered an important characteristic, as past research has suggested learning style preferences vary

across academic disciplines (Kolb, 1976).

Table 1

Subject Areas Responding to Survey

School	Subject	School	Subject
Community College of	AST	Truckee Meadows	CIT
Southern Nevada	BIOL	Community College	MATH
	CIT		PSC
	EDUC		PSY
	ENG	Western Nevada	ACC
	HIST	Community College	ART
	HLTH		CIS
	MATH		GEOG
Great Basin College	MATH		MATH

Follow-up phone calls to 5 of the instructors who did not distribute the survey revealed two main reasons for not participating. The most common reason cited was that the instructors and their students were too busy. The other reason cited was that some instructors viewed the survey as an outside evaluation of their teaching and their course. Despite assurances of anonymity, these instructors did not want to participate.

One hundred and fifty students responded to the questionnaire. Because three of the 24 instructors participating in the survey were teaching more than one Internet-based class, the survey was distributed to 28 different classes. Class sizes varied from 3 to 80 students per class. Based on an average class size of 29 students, the survey was distributed to approximately 812 students. The 150 responses represent an 18 percent response rate. Comments included with some responses indicate the typical student in an

Internet-based course is often very busy. This student profile, combined with the length of the survey may have resulted in the relatively low response rate.

Table 2

Number of Responses by School

School	Gender		Total	Percent
	Female	Male		
Community College of Southern Nevada	64	12	76	51%
Great Basin College	2	0	2	1.3%
Truckee Meadows Community College[a]	23	8	31	21%
Western Nevada Community College	33	7	40	27%
Total	122	27	149	
Percent	81.9%	18%		

[a] One respondent did not specify gender

Table 2 shows that over half of the responses received came from the Community College of Southern Nevada. This is consistent with the fact that 39 of the 80 Internet-based classes offered by the Nevada community colleges were offered at CCSN. Great Basin College had the fewest participants with only one of 17 classes responding. The primary reason for the low response rate from Great Basin College was that nine of the 16 Internet-based classes offered were taught by two instructors who declined to participate in the study.

Table 2 also shows that 81.9 percent of the survey respondents were female. This is consistent with the results of the pilot study, where 82.5 percent of the respondents were female. A follow-up investigation was conducted to determine the reason for the

larger number of responses from female students. Research directors at the participating institutions reported that 70 percent of the students enrolled in Internet-based classes were female and that 55 percent of all students enrolled in the colleges were female. The reason for this large percentage of female students has not been studied, but comments included in responses indicate this format of classes is popular with parents. As a result, many mothers may be more attracted to Internet-based classes because they can attend class without having to arrange for child care.

Given the large percentage of women participating in these classes, the high percentage of responses from female students is relatively consistent with the population included in the study. However, the fact that the percentage of female respondents was higher than the percentage in the population indicates women may have been more willing to participate in the survey. As a result, the study data may include a gender bias.

Table 3

Demographics of Respondents

	N	Minimum	Maximum	Mean	Std. Deviation.
Age	149	17	63	32.05	10.14
GPA	116	2.00	4.00	3.47	0.43
No. of Internet Courses Taken	144	1	6	2.49	1.76

The respondents' education levels ranged from three students who had not completed High School to two students who had completed a master's degree. The majority of respondents (71.3%) indicated they had completed some college, but had not completed a degree. The respondents' ages ranged from 17 to 63 years old, with a mean

age of 32.05 (SD = 10.14). Internet-based education was not new to many of the respondents, as the mean number of Internet-based courses they had completed was 2.49 (SD = 1.76), and some had completed as many as six Internet-based courses. The mean, self-reported GPA for the respondents was 3.47 (see Table 3).

Perceived Helpfulness of Internet-based Instruction

This section presents descriptive information regarding Nevada Community college students' perceptions of the helpfulness of Internet-based methods of instruction. It includes students' overall perceptions of the helpfulness of Internet-based instruction, as well as the helpfulness and quality ratings of each of the thirteen methods of instruction included in the study. This section also presents correlations among these ratings to identify student response patterns.

Study participants were asked to rate how helpful their class was in learning the required material. Ratings could range from "one" to "eight", with a rating of "one" indicating the class was not helpful at all and a rating of "eight" indicating it was extremely helpful. The results show that students felt Internet-based courses were helpful in learning the course material. Responses ranged from one to eight, with a median rating of 6, a mean rating of 6.21 and a standard deviation of 1.41.

Perceptions of Internet-based courses were also obtained from the comments provided by 64 of the respondents. Twenty seven of these comments (42.2%), indicated students were pleased with Internet-based courses in general, primarily because of convenience. However, ten of the general comments (15.6%) indicated the respondent did not like Internet-based instruction. Eighteen of the comments (28.1%) also dealt with unfavorable aspects of specific courses.

The other common category for comments involved technical problems. Nine students (14.1%) noted technical problems with either the chat feature of their course or accessing the course through America Online Internet service. The complete list of comments, with instructor and class names removed to protect anonymity, is provided in appendix D.

Helpfulness Ratings for Specific Methods of Instruction

Although a variety of methods of instruction are available in Internet-based courses, the survey instrument asked students to rate thirteen specific methods of instruction. These methods of instruction were intended to represent the range of methods available, and to correspond to specific learning style preferences addressed in the study.

As expected, none of the courses included all of the methods of instruction defined in the survey. Table 4 shows that all of the classes in the study used a schedule and e-mail. None of the classes in the study included video presentations, audio presentations or audio/video conferences.

Table 4 also shows there were conflicting responses for all of the methods of instruction. In all but one class, the majority of respondents were in agreement on whether or not a specific method of instruction was included. In these classes responses that did not agree with the majority were considered errors, and those responses were not included in the analysis of helpfulness and quality ratings. The responses were evenly split for one class on several methods of instruction, so the instructor was contacted to determine if those methods were actually included in the class. In all classes, if students provided ratings for a method of instruction that was not actually provided in the class,

their ratings were not included in the analysis of helpfulness and quality ratings.

Table 4

Methods of Instruction Included in Internet-based Classes

	Number of Classes			
	Not Included	Included	% Included	Conflicting Responses
Schedule	0	28	100	2
E-mail	0	28	100	2
Threaded Discussion	2	26	93	8
Course Map	2	26	93	25
Chat	4	24	86	26
Links for Exploration	5	23	82	24
Text Presentations	6	22	79	21
Activities	7	21	75	42
Pictures, Graphics, Animations	9	19	68	38
Instructor Control of Computer	27	1	0	21
Video Presentations	28	0	0	14
Audio Presentations	28	0	0	12
Audio/Video Conferencing	28	0	0	8

The large number of conflicting responses indicate there was some misunderstanding about the description or implementation of these methods of instruction. The anonymous survey method used for this study made it impossible to follow up with students about their specific responses, but an analysis of the specific results suggests some reasons for many of the conflicting answers. Six students indicated

all elements were included in their classes. These students also submitted high ratings for quality and helpfulness for all elements in the survey. One possible explanation for these ratings is that these students were very happy with their classes and wanted to submit the highest possible rating for their classes.

Another possible explanation for the erroneous ratings is that students may have been combining ratings for all of their Internet-based courses. Some students included comments that indicated they were taking more than one distance education class, and some of these classes may have included different elements. This is especially true of students who may have also been taking broadcast television distance education classes. These classes were not invited to participate in the survey, but it is likely some of the survey respondents were also enrolled in those classes.

The final possible general reason for the conflicting responses is student error in entering the responses. A crosstabs analysis revealed 19 cases where students provided helpfulness ratings for a method of instruction that they indicated was not available in their class. Sixteen students also submitted responses indicated one of the methods of instruction was available in their course, but they did not provide helpfulness ratings for that method of instruction.

The largest number of conflicting responses was for activities, with 28% of the responses conflicting with the class. Of the 42 conflicting responses for activities, 26 indicated activities were not available in the class, when they actually were available. The majority of classes participating in the study included on-line practice quizzes and graded tests. Quizzes were specified as interactive activities in the survey question, but many students may not have interpreted them as activities when responding to the survey.

Large numbers of conflicting responses were also received for graphics, course maps, text presentations and links. Discussions with instructors revealed that many of these courses were delivered using the WebCT system. This system provides a menu and icons for students to navigate to the various elements of their course. Some courses used this interface only to deliver tests and provide access to e-mail. These courses did not include any other Internet content. In these courses, some students may have viewed the standard menu provided by WebCT as a course map and as a text presentation including graphics and links. The WebCT system also provides a chat room for all classes, but not all instructors use the chat room. This may explain the large number of conflicting responses for chat, as some students may have rated it as available but not used, while other students in the same class rated it as not available.

The results for specific methods of instruction shown in Table 5 address the student helpfulness ratings of methods of instruction offered by Internet-based courses. Students were asked to rate each of the thirteen methods of instruction based on how much they helped them understand the course material. Ratings could range from one to eight, with a rating of one indicating the method of instruction was not helpful at all and a rating of eight indicating it was extremely helpful. Erroneous ratings for elements not actually included in a course were removed prior to analysis.

E-mail received the highest helpfulness ratings ($\underline{M}$ = 7.08, $\underline{SD}$ =1.28), followed by a course schedule ($\underline{M}$ = 6.97, $\underline{SD}$ =1.37) and interactive activities ($\underline{M}$ = 6.93, $\underline{SD}$ =1.31). Discussions with four instructors revealed that practice quizzes were a popular form of on-line activity. The other highly rated methods of instruction were all elements that are included in most Internet-based courses and are relatively simple and inexpensive to

implement. Chat received the lowest rating, which was consistent with student comments noting technical and scheduling problems with chat sessions.

Table 5

Student Helpfulness Ratings for Methods of Instruction

	N	Min.	Max.	Mean	Std. Dev.	Median
E-mail	148	2	8	7.08	1.28	8
Schedule	145	2	8	6.97	1.37	7
Interactive Activities	84	3	8	6.93	1.31	7
Course Map	116	3	8	6.75	1.25	7
Threaded Discussion	139	1	8	6.65	1.73	7
Text Presentations	106	1	8	6.39	1.42	7
Links	105	1	8	6.38	1.63	7
Pictures, Graphics, Animations	71	1	8	6.32	1.79	7
Instructor Control of Computer	3	4	7	5.67	1.53	6
Chat	102	1	8	5.49	2.27	6
Video Presentations	0					
Audio/Video Conferencing	0					
Audio Presentations	0					

Perceived Quality of Internet-based Methods of Instruction

The survey also asked students to rate the quality of each of the methods of instruction included in their Internet-based courses. This question was included primarily to encourage students to separate the concepts of quality and helpfulness of a method of instruction. For example, a video presentation might be very well produced and deliver very high audio quality and picture resolution, but may not help the student understand

the course material. Ratings could range from "one" to "eight", with a rating of "one" indicating very poor quality and a rating of "eight" indicating excellent quality.

Table 6 shows the students' quality ratings for the methods of instruction included in the survey. The ratings indicate students thought the majority of the elements in their classes were of high quality. The quality ratings were very similar to the perceived effectiveness ratings, with e-mail and course schedule rated the highest quality, and chat and instructor control of the students' computer rated the lowest quality.

Table 6

Student Quality Ratings for Methods of Instruction

	N	Min.	Max.	Mean	Std. Dev.	Median
E-mail	148	3	8	7.03	1.22	7
Schedule	145	2	8	6.86	1.32	7
Interactive Activities	83	2	8	6.81	1.31	7
Course Map	117	2	8	6.76	1.25	7
Threaded Discussion	139	1	8	6.66	1.68	7
Links	104	1	8	6.64	1.42	7
Text Presentations	104	3	8	6.58	1.18	7
Pictures, Graphics, Animations	70	2	8	6.49	1.44	7
Chat	101	1	8	5.73	1.99	6
Instructor Control of Computer	3	4	6	5.33	1.15	6
Video Presentations	0					
Audio/Video Conferencing	0					
Audio Presentations	0					

Correlations Between Perceived Helpfulness and Quality Ratings

The relationship between perceived helpfulness ratings and quality ratings was tested using the Spearman Correlation Coefficient. It was expected that methods of instruction receiving higher ratings for helpfulness would also receive higher ratings for quality. The results in Table 7 indicate significant and large correlations for the nine items with enough responses to test. The Instructor Control of Your Computer method of instruction was excluded from the correlation because there were only three responses in that category.

Table 7

Correlations Between Helpfulness Ratings and Quality Ratings

	N	Spearman's rho	P
Course Map	116	.937	<.001
Schedule	143	.878	<.001
Pictures, Graphics, Animations	70	.845	<.001
Interactive Activities	83	.834	<.001
Text Presentations	104	.819	<.001
Links for Exploration	103	.790	<.001
Chat	101	.781	<.001
E-mail	148	.776	<.001
Threaded Discussion	138	.700	<.001

Consistency of Student Ratings

In order to investigate a possible response bias, Cronbach's alpha was calculated for the overall course effectiveness rating and the seven methods of instruction that were available in most courses (alpha = 90, N = 24). The results indicate a very high level of

correlation among the ratings. This may indicate that students thought all of the methods of instruction in their class were equally helpful. It might also indicate a response bias where students formed an overall opinion of the class, and their ratings of all of the methods reflected this global opinion.

Relationship Between Learning Styles and Perceived Helpfulness Ratings

A correlational analysis was conducted to investigate the relationship between learning style preferences and helpfulness ratings of methods of instruction. A review of the literature had identified specific methods of instruction that had a theoretical relationship to each learning style dimension. These specific relationships are noted in Table 8.

Correlations were tested using the Spearman Correlation Coefficient and an experiment-wise alpha of .05. The Bonferroni correction was used to maintain the experiment-wise alpha for the 36 tests performed, and the procedure-wise alpha was set to .001. Analysis of responses for the Instructor Control of Your Computer method was omitted due to the small N of 3. None of the correlations identified were significant at the experiment-wise level.

Table 8

Correlations Between Learning Styles and Perceived Helpfulness of Methods of Instruction

Method of Instruction	Active/Reflective Score	Sequential/Global Score	Sensor/Intuitor Score	Visual/Verbal Score
Schedule	-.002	.029[a]	-.106[a]	-.045
E-mail	-.112[a]	-.021	-.108[a]	-.157
Text Presentations	-.051	.056	-.192[a]*	-.052[a]
Threaded Discussion	-.022[a]	.023	.048	-.007
Course Map	-.128	.103[a]	.010	-.149
Links for Exploration	-.257[a]**	.158[a]	.051[a]	-.099
Chat	-.099[a]	.033	.095	-.140
Graphics, Animation	-.218	.128	-.158[a]	-.259[a]*
Interactive Activities	-.193[a]	-.017	.038	-.155
Video Presentations	-	-	-	-[a]
Instructor Control	-	-	-	-
Audio Presentations	-	-	-	-[a]
A/V Conferencing	-[a]	-	-	-[a]

[a]Theoretical relationship

* $p < .05$

**$p<.01$

Distribution of Student Learning Styles

Student learning style scores were measured as odd numbers on a scale of -11 to 11, with a score of -11 indicating a very strong preference for the first style in the dimension, and a score of 11 indicating a very strong preference for the second style in the dimension. For example, a score of -11 on the active/reflective dimension indicates a

very strong preference for active learning, and a score of 11 indicates a very strong preference for reflective learning. For the purpose of analysis, these raw scores are combined into six pairs, indicating a strong, moderate or slight preference for each style. For example, raw scores of 9 and 11 on the active/reflective dimension are combined into a single category to indicate a strong preference for the reflective learning style.

The summary of learning styles scores in Table 9 shows the average student was fairly well balanced on the active/reflective (M = -.40, SD = 4.69) sequential/global (M = -.56, SD = 3.94) learning style dimensions. Respondents expressed a slight preference for the sensing (M = –2.20, SD = 3.94) and visual (M = -1.91, SD = 5.24) learning styles.

Table 9

Learning Styles Scores of Students in Internet-based Community College Classes

	Minimum	Maximum	Mean	Std. Deviation
Active/Reflective Score	-11	11	-.40	4.69
Sensing/Intuitive Score	-11	9	-2.20	3.94
Visual/Verbal Score	-11	11	-1.91	5.24
Sequential/Global Score	-9	11	-.56	3.94

N=150

Figures 1 through 4 summarize the distribution of responses from both the pilot study of students completing Internet-based classes and the final study of students enrolled in Internet-based classes. Figure 1 shows that the majority of respondents to the final study (52%) preferred the active learning style, while the majority of respondents to the pilot study (54.3%) preferred the reflective learning style. Figure 2 shows the

majority of students from both the pilot study (75.4%) and the final study (67.3%) preferred the sensing learning style. The majority of students from both studies also expressed a preference for the visual learning style with 70.1% of the respondents to the pilot study and 65.3% of the respondents to the final study preferring the visual learning style (see Figure 3). Figure 4 shows majority of students from both the pilot study (68.4%) and the final study (58%) expressed a preference for the sequential learning style.

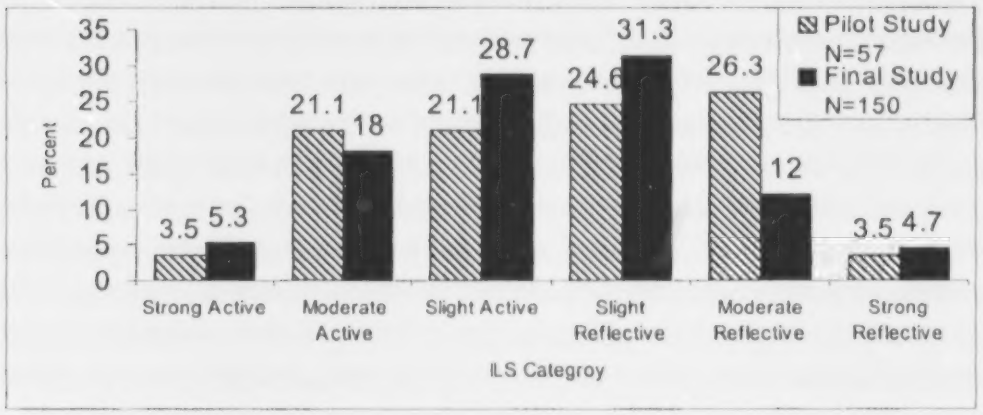

Figure 1. Distribution of active/reflective learning styles scores.

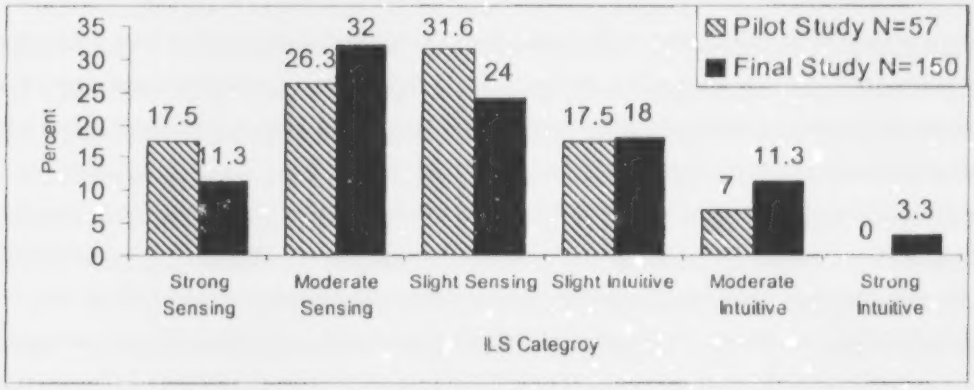

Figure 2. Distribution of sensing/intuitive learning styles scores.

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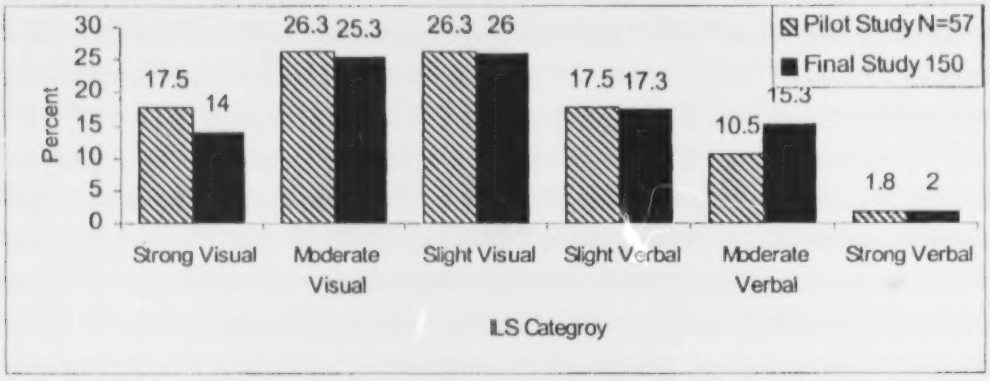

Figure 3. Distribution of visual/verbal learning styles scores.

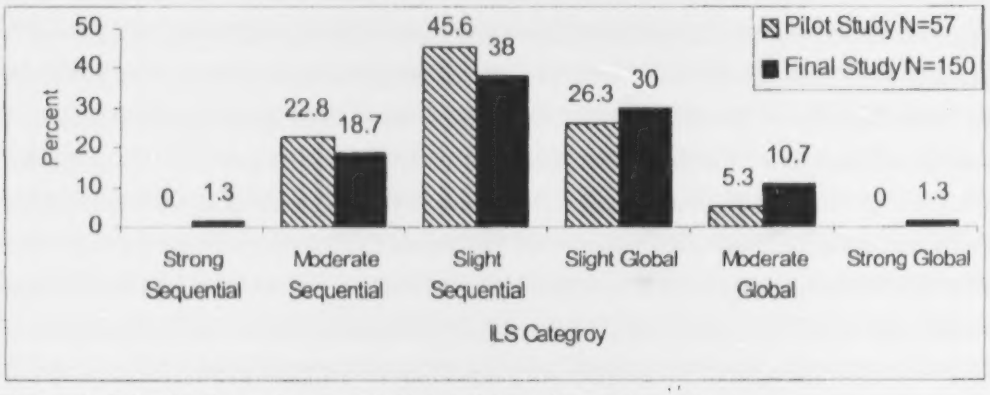

Figure 4. Distribution of sequential/global learning styles scores.

A one-sample Chi-Square test was used to answer the first research question: Is there a difference in the distribution of learning styles as measured by the ILS between students in Internet-based community college classes and college students in general? This test compared the learning styles distributions from the final study to expected distributions for the active/reflective (Kolb, 1976) and sensing/intuitive (Myers and McCaulley,1985) dimensions found in previous studies. Using the Bonferroni correction for two concurrent tests, each procedure must be significant at the .025 level to meet an experiment wise alpha rate of .05.

Table 10 shows the Chi-Square results for the active/reflective learning style were significant (Chi-Square = 6.37, p = .012). As a result the null hypothesis that the distribution of learning style preferences of students in Internet-based community college classes as measured by the ILS is 62% active and 38% reflective was rejected. The results showed that the students enrolled in Internet-based classes included significantly more reflective learners (48%) than was predicted by past research.

Table 10

Chi-Square for Active/Reflective Learning Style

Category	Raw Scores	Observed		Expected		Residual
		N	Pct.	N	Pct.	
Active	-1,-3,-5,-7,-9,-11	78	52%	93	62%	-15.0
Reflective	1,3,5,7,9,11	72	48%	57	38%	15.0
Chi-Square = 6.37 P = .012						

Table 11 shows the Chi-Square results for the sensing/intuitive learning style were not significant, Chi-Square=3.36, p=.067. As a result the null hypothesis that the distribution of learning style preferences of students in Internet-based community college classes as measured by the ILS is 60% sensing and 40% intuitive was not rejected.

Table 11

Chi-Square for Sensing/Intuitive Learning Style

Category	Raw Scores	Observed		Expected		Residual
		N	Pct.	N	Pct.	
Sensing	-1,-3,-5,-7,-9,-11	101	67%	90	60%	11.0
Intuitive	1,3,5,7,9,11	49	33%	60	40%	-11.0
Chi-Square = 3.36	P = .067					

A one-sample Chi-Square test was also used to answer the second research question: Is there a difference in the distribution of learning styles as measured by the ILS between students who enroll in Internet-based community college classes and students who successfully complete those classes? This test compared the learning styles distributions from the final study, which represented students enrolled in Internet-based community college classes to expected distributions established in the pilot study of students successfully completing Internet-based community college classes. Using the Bonferroni correction for four concurrent tests, each procedure must be significant at the .01 level to meet an experiment wise alpha rate of .05. Table 12 shows the Chi-Square results were significant at this level for the sequential/global learning style. Therefore, the null hypothesis that the distribution of learning styles of community college students who enroll in Internet-based classes is 69% sequential and 31% global as measured by the ILS was rejected. The results showed that the students enrolled in Internet-based classes included significantly more global learners (42%) than was predicted by the students who successfully completed their Internet-based classes.

Table 12

Chi-Square for Sequential/Global Learning Style

Category	Raw Scores	Observed		Expected		Residual
		N	Pct	N	Pct	
Sequential	-1,-3,-5,-7,-9,-11	87	58%	103	69%	-16.0
Global	1,3,5,7,9,11	63	42%	47	31%	16.0
Chi-Square = 7.93	P = .005					

The results for the sensing/intuitive learning style in Table 13 show both an expected and observed preference for the sensing learning style, with 75 percent of the respondents from the pilot study and 67 percent of the respondents from the final study preferring this style. The distribution of learning styles for students in the final study was not significantly different than predicted by the pilot study. As a result, the null hypothesis that the distribution of learning styles of community college students who enroll in Internet-based classes is 75 percent sensing and 25 percent intuitive as measured by the ILS was not rejected.

Table 13

Chi-Square for Sensing/Intuitive Learning Style

Category	Raw Scores	Observed		Expected		Residual
		N	Pct	N	Pct	
Sensing	-1,-3,-5,-7,-9,-11	101	67%	113	75%	-12.0
Intuitive	1,3,5,7,9,11	49	33%	37	25%	12.0
Chi-Square = 5.17	P= .023					

The results for the active/reflective learning style were more widely distributed and were analyzed across four categories. Table 14 shows that the majority of students in the final study (80%) were in the moderate and slight preference categories as predicted by the pilot study (72%). The distribution of learning styles for students in the final study was not significantly different than predicted by the pilot study and the null hypothesis that the distribution of learning styles of community college students who enroll in Internet-based classes is 16% strong to moderate active, 30% moderate to slight active, 42% moderate to slight reflective, and 12% strong to moderate reflective as measured by the ILS was not rejected.

Table 14

Chi-Square for Active/Reflective Learning Style

Category	Raw Scores	Observed		Expected		Residual
		N	Pct	N	Pct	
Strong-Moderate Active	-7.-9,-11	18	12%	24	16%	-6.0
Moderate-Slight Active	-1,-3,-5	60	40%	45	30%	15.0
Moderate-Slight Reflective	1,3,5	60	40%	63	42%	-3.0
Strong-Moderate Reflective	7,9,11	12	8%	18	12%	-6.0
Chi-Square = 8.63	P=.034					

Table 15 shows the expected and observed frequencies for the visual/verbal dimension. The distribution of learning styles for students in the final study was not significantly different than predicted by the pilot study. As a result, the null hypothesis that the distribution of learning styles of community college students who enroll in Internet-based classes is 33% strong to moderate visual, 37% moderate to slight visual,

23% moderate to slight verbal, and 7% strong to moderate verbal as measured by the ILS was not rejected.

Table 15

Chi-Square for Visual/Verbal Learning Style

Category	Raw Scores	Observed		Expected		Residual
		N	Pct	N	Pct	
Strong-Moderate Visual	-7,-9,-11	40	27%	50	33%	-10.0
Moderate-Slight Visual	-1,-3,-5	58	39%	55	37%	3.0
Moderate-Slight Verbal	1,3,5	44	29%	34	23%	10.0
Strong-Moderate Verbal	7,9,11	8	5%	11	7%	-3.0
Chi-Square = 5.92	P = .115					

Summary of the Results

The results of this study identified the demographics and learning style preferences of students enrolled in Internet-based courses offered by the four Nevada community colleges. It also identified students' ratings of the helpfulness and quality of the methods of instruction offered in their Internet-based courses. The study also investigated correlations between student learning style preferences and helpfulness ratings for methods of instruction.

The study found that while 55 percent of the total enrollment in Nevada community colleges is female, over 70 percent of the students enrolled in Internet-based classes at these institutions are female. Participants range in age from 17 to 63, and the average student is approximately 32 years old. Most students in the study have taken some college courses, but have not finished a degree. Their average, self-reported GPA

is 3.47.

The study also found students' learning style preferences were not evenly distributed. In general, students indicated a preference for the sensing, sequential and visual learning styles. A one-sample Chi-Square test showed that students enrolled in Internet-based community college classes in Nevada included a significantly larger number of reflective learners than college students in general. Another one-sample Chi-Square test showed that a significantly larger number of students enrolled in Internet-based classes (final study) showed a preference for the global learning style than was predicted by students completing Internet-based classes (pilot study). This provides evidence that global learners may be less likely to complete Internet-based community college classes. The final study group also included a larger number of preferences for the active and sensor learning styles, but these differences were not significant.

Student ratings for both quality and helpfulness of methods of instruction were highest for e-mail and a detailed schedule. Student ratings were lowest for chat. Audio presentations, video presentations, and audio/video conferencing were not available to the students who responded to the survey. An analysis of student ratings indicated a possible response bias, as each student's helpfulness ratings tended to be consistent for all methods of instruction.

The study identified a possible trend toward a relationship between student learning styles and helpfulness ratings for specific methods of instruction that correspond to correlations suggested by learning styles theory. However, these correlations between links and active learners, graphics and visual learners, and text presentations and sensing learners were not significant.

Chapter 5

Discussion and Conclusions

Overview

This study used a web-based survey instrument to investigate student learning styles and the methods of instruction used in Internet-based courses offered by the four community colleges in the University and Community College System of Nevada. A review of related literature indicated student learning styles are considered an important factor in designing instructional materials, but research had produced mixed results in identifying specific methods of instruction that corresponded to a student's learning style preferences. These mixed results were attributed to a lack of a theoretical correspondence between the learning styles identified by various instruments and the instructional methods tested. For example, past research has investigated the relationship between student achievement in hypermedia instruction and preferences for field independence/dependence. However, this research was not based on any theoretical correspondence between field independence/dependence and the methods of instruction offered to students (Dillon & Gabbard, 1998). This study used literature to establish a theoretical correspondence between learning styles measured by the Index of Learning Styles (ILS) and thirteen methods of instruction available in Internet-based courses. It then investigated student learning styles measured by the ILS, student preferences for Internet-based methods of instruction, and the relationship between learning styles and methods of instruction using the following research questions:

1. Is there a difference in the distribution of learning styles as measured by the ILS between students in Internet-based community college classes and college

students in general?

2. Is there a difference in the distribution of learning styles as measured by the ILS between students who start Internet-based community college classes and students who successfully complete those classes?

This section interprets the results of the investigation of each research question and the implications of those results. It also includes summary conclusions and recommendations for future research.

Student Learning Styles

Overall, respondents to this study showed a preference for the active, sensing, visual and sequential learning styles. Combining these preferences creates a general picture of the learning styles of the majority of students responding to this study. The typical student starting these classes is a female who prefers learning through well defined, sequential steps, likes solving problems with well-established methods, and does not mind repetition. The typical student also enjoys learning facts and prefers experimentation to reflection. She has a slight preference for working with others, is patient with details and good at memorizing facts. In addition to this general profile, the study found evidence of significant differences in the distribution of student learning styles between college students in general, students enrolling in Internet-based classes and students completing Internet-based classes.

Learning Styles of Students Enrolling in Internet-based Classes

Despite a slight overall preference for the active learning style, this study found evidence that students starting Internet-based community college classes in Nevada show a stronger preference for the reflective learning style than college students in general.

Students with this learning style prefer to start learning a new topic with a theory and think things through before they attempt a practical application of the theory. Therefore, the results of this study support Limbach, Weges and Valcke's (1997) findings that a majority of The Open University's Internet-based students preferred this mode of learning.

This study did not investigate the reasons behind the skewed distribution of learning styles, but based on Kolb's theory that students gravitate toward classes that emphasize learning styles they prefer, it would be reasonable to hypothesize that the Internet-based classes in this study emphasize methods of instruction that are more attractive to reflective learners. Because this study did not make a direct comparison to psychometric normative data for this learning style, or to other students in the general Nevada community college population, further research is needed to confirm this hypothesis.

This finding has important implications for community colleges hoping to grow their Internet-based educational offerings. On the positive side, Internet-based classes may be providing an alternative to traditional classroom instruction for reflective learners. This idea is best illustrated by a comment from one respondent to this study who stated, "I like having a class that I can just get the stuff done without all the extra fluff in lecture classes that's just a waste of time". This type of student may have motivational problems in traditional classes, or may avoid college classes all together. As a result, community colleges may want to specifically target this type of student with information about Internet-based classes and how they fit the reflective students' style of learning.

The negative aspect of this finding is that the methods currently used by Nevada

community colleges for Internet-based instruction may not be attractive to the majority of college students. Kolb (1976) found a majority of college students prefer an active learning style, and this preference was stronger for students majoring in certain fields like Nursing, Engineering and Business. As a result, colleges may have difficulty attracting more students to Internet-based instruction. Additionally, students in specific majors may find Internet-based classes are more difficult and less motivating than traditional classroom instruction.

Colleges have two choices for addressing this issue. The first is revising the curriculum to provide more activities for active learners. Literature suggests active learners prefer to apply concepts either through activities or discussion. The Internet-based classes included in this study offered communication through threaded discussion groups and chat features, as well as on-line practice quizzes. Even though theory suggests these features would be attractive to active learners, they may not be providing the type of activity these learners prefer. Although Internet-based discussions groups provide an opportunity to exchange information, their asynchronous nature does not allow the interactivity and spontaneity available in classroom conversations. A chat function offers a bit more interactivity, but since the messages must be typed, they also lack the spontaneity and flow of a classroom conversation. Quizzes may also be lacking as activities because they don't give students an opportunity to experiment with practical applications of course material.

As a result, developers of Internet-based classes may need to explore other alternatives for addressing the preferences of active learners. These alternatives could include audio and video conferencing that more closely match classroom discussions.

They may also include additional activities to encourage the application of course concepts. Interactive computer-based activities and simulations could be programmed to meet this need, but traditional activities can also be used in this environment. For example, computer networking students could be asked to design a computer network to meet a specific need. Drawings and narratives can be used to explain the design and the results could be submitted to the instructor via e-mail, fax or the postal service.

Although curriculum adaptations may be the best answer, they can also involve significant expenditures of time and money. As a result, a second alternative available to community colleges is better advisement. Students expressing an interest in Internet-based classes should complete a learning styles assessment and *active* learners should be provided with a clear understanding of the limitations of Internet-based classes in addressing the preferences of active learners. Ideally, these active learners should also be provided with strategies for dealing with these limitations if they do decide to pursue an Internet-based class. These strategies might include arranging meetings with other students to discuss the course material, or setting aside additional time for finding their own methods to experiment with practical applications of the course material.

Learning Styles of Students Enrolling in Internet-based Classes

The results of this study also indicated the distribution of learning styles of students who were starting an Internet-based community college class were significantly different than the distribution of learning styles of students who had completed Internet-based community college classes. Specifically, the group of students who were starting Internet-based classes (final study) included significantly more students who preferred the global learning style than was predicted by the group of students who were completing

Internet-based classes (pilot study). This provides tentative evidence that global learners may be less likely to complete Internet-based community college classes.

Student comments also provide anecdotal support for the hypothesis that global learners are less likely to complete Internet-based community college classes. Comments from the students completing an Internet-based class (pilot study) included four comments requesting more structure and guidance. For example, one student wrote, "It will be very hard to talk me into taking another Internet-based class. Half of the effort of any class is figuring out what the instructor is expecting of you and how they grade." This type of comment is consistent with a sequential learners' preference for structure and is in direct contrast with a global learners' preference for less structure. The pilot study did not include any comments reflecting a global learners' preference for less structure. This is consistent with the idea that fewer global learners were completing these classes.

By contrast, the students starting an Internet-based class (final study) included four comments requesting less structure. For example, one student wrote, "I like it better when you are allowed to work at your own pace. I am the type of person who likes to do a lot of things at once, instead of a steady pace. I find myself discouraged when pushed and told that I am behind." These comments are consistent with a global learners' preference for less structure and more opportunity to explore the subject. The final study did also include five comments that requested the additional structure preferred by sequential learners. These results are consistent with the idea that both sequential and global learners are enrolling in Internet-based classes.

This study did not find significant differences between the pilot group and the final group in the distribution of learning styles on the other dimensions measured by the

ILS, but trends identified for the intuitive and active learning styles indicate more research on these styles may be useful.

These two groups could not be compared as independent samples, because the final study group included students who will complete their classes. The one-sample method that was used in this study to compare the distributions of learning styles is a weak test in that regard. However, the test results and anecdotal comments do provide some evidence that community college students with specific learning styles may be less likely to complete Internet-based courses.

Given the dropout rate of approximately 40% found in the pilot study, these results suggest student learning styles are an important area for future study of Internet-based education. If additional support for this theory can be established in future studies, it may prove valuable in reducing the dropout rate in Internet-based classes offered by community colleges. As mentioned above, educators can address this issue through modifications to the curriculum and student advisement.

Where possible, classes could be modified to be more accommodating to students with global, intuitive, and active learning styles. These learners prefer discovery learning. They prefer to view the big picture and discover new possibilities and relationships. They prefer to absorb material from a variety of sources and they like to work in groups. Modifying Internet-based courses to accommodate these learning styles would be the preferred strategy, as it would also make these course attractive to a more diverse group of students.

When technology or subject matter prevent these modifications, students could be pre-screened on their learning style preferences. Students with learning styles that are

less likely to complete Internet-based courses could be given suggestions for methods to supplement their course, such as study groups or experimental activities. If these supplements are not practical, students could be referred to other formats of the class.

Perceived Helpfulness of Internet-based Methods of Instruction

This study also provided information on general student preferences for Internet-based instruction. Overall, students rated Internet-based instruction as effective in helping them learn the course material with a median rating of 6, a mean rating of 6.21 and a standard deviation of 1.41. Students provided the highest helpfulness ratings for e-mail and a detailed course schedule. They identified instructor control of their computer and chat as the least helpful methods of instruction. The chat ratings may have been influenced by problems with students scheduling chat participation, and technical problems with the chat function in several classes. Audio presentations, video presentations and audio/video conferencing were not included in any of the courses that responded to the survey. As a result, this study was not able to evaluate students' perceptions of these methods of instruction.

These results must be interpreted with caution, as they are likely to be influenced by the implementation of the instructional methods in individual classes. This is indicated by the high level of correlation between helpfulness ratings and quality ratings for each of the elements. It is also supported by the idea that students tended to be very consistent in their ratings of the course and the methods of instruction. A Cronbach's alpha of .90 for the overall effectiveness rating and the eight methods of instruction included in most courses indicates a high correlation among the items. The conflicting survey responses also supported the idea that students showed a response bias when

completing the survey. Of the 150 respondents, 19 provided effectiveness ratings for elements that were not included in their courses. These student ratings for methods of instruction that were not used in their courses were consistent with their ratings of other elements in the course. As a result, the helpfulness ratings must be interpreted with the understanding that they may include a response bias.

The fact that these results include 28 different classes in 15 different subject areas, partially mitigates this problem and allows some general conclusions to be drawn. First, the overall course ratings, combined with student comments support the idea that Internet-based courses do not have to include audio, video or live communication features to be considered effective by the students. Given a clear understanding of what is required and reasonable opportunities for communication with the instructor, students felt they were able to learn the course material using text presentations, e-mail and threaded discussion. However, given the learning styles distributions above, it must be emphasized that these methods of instruction worked well for students with specific learning styles.

Secondly, the results for the chat feature indicate the need for methods of instruction to be technically reliable and convenient. Comments from students who were not able to use chat indicated they were frustrated by technical problems or inconvenient scheduling. In contrast, comments from those successfully using chat were generally positive.

These results have important implications for both instructors and course designers. The production and delivery of audio and video presentations and conferences can be expensive and time consuming. Arranging times for live communication through

chat or conferencing software can also be difficult. These elements may add interest and appeal to a course and as noted above, they may make classes more attractive to *active* learners. However, they are not necessary for a course to meet students' expectations for a helpful class. As a result, the priority for developing and delivering Internet-based instruction should be providing a clear understanding of the course requirements, ample opportunity for communication with the instructor, and insuring that the technical features of a course are reliable.

Relationship Between Learning Styles and Helpfulness Ratings

This study did not find any significant correlations between learning styles and student helpfulness ratings. However, the study did find a possible trend for a relationship between the active learning style and links for exploration. It also found a possible trend for relationships between the visual learning style and graphics, and the sensing learning style and text presentations. Since all three of these possible relationships are consistent with theoretical relationships between learning styles and methods of instruction, future research should be conducted in this area.

In considering these results, it is important to note that the population included in the study and the methodology used may have contributed to the lack of significance of the correlations. As noted above, the skewed distribution of learning styles among the participants restricted the range of responses. A more normally distributed range of learning styles might have produced more variance in learning style scores, and possibly more opportunity for correlations to be significant. The helpfulness ratings may also have been influenced by the instructors' specific implementation of each of the methods of instruction and a student response bias noted above. As a result, learning style

considerations may have accounted for only a small portion of the variance in student helpfulness ratings.

Given these limitations, this may still be an important area of research. In order to attract and retain students with a variety of learning styles, Internet-based courses must be designed to address those learning styles. This will require the identification of instructional methods that are helpful for each learning style. Future studies should address the limitations of this study by including a sample of the general student population, not just students enrolled in Internet-based classes. Ideally, these studies should be conducted in an experimental environment that controls for quality, instructor style and other confounding variables.

Conclusion

The skewed distribution of learning styles found in this study suggests that students with reflective learning styles may be more attracted to Internet-based classes than active learners. The difference in the distribution of learning styles between the pilot study of students completing Internet-based classes and the final study of students starting Internet-based classes also supports the idea that global learners are less likely to complete Internet-based community college classes. Given the high dropout rates reported for these classes, this issue warrants further research.

Students participating in Internet-based courses expressed preferences for e-mail communication and a detailed schedule of specific course requirements. In comments, they also noted the need for reliable technology and convenient scheduling of real-time activities. Courses participating in the study did not include audio presentations, video presentations or audio/video conferencing. This study found evidence that these elements

were not required for a course to receive high effectiveness ratings from students. However, because the learning styles of the participants showed a bias away from these methods of instruction, future research is warranted.

Although possible trends for relationships between methods of instruction and learning styles were noted, no significant correlations were found. The skewed distribution of learning styles among the subjects, and class specific influences on helpfulness ratings were considered limitations to the effectiveness of this test. These limitations, combined with a trend toward a relationship at the procedure level, indicate further study is also warranted in this area.

The results from these three areas of investigation provide some evidence that learning styles play an important role in the design and implementation of Internet-based instruction and that a clear understanding of the course requirements, ample opportunity for communication with the instructor, and reliable technical features are most important to students. These results indicate students with specific learning styles exhibit preferences for certain types of instruction, but additional research is needed to identify specific methods of instruction that are most helpful for each of the learning style preferences. Since learning styles may be a factor in both the probability of a student enrolling in an Internet-based class and the probability of a student completing an Internet-based class it is important for researchers, course designers and instructors to address these learning style preferences. It is also important to insure that technical features that are implemented to meet these learning style preferences are reliable and convenient to use. As more is learned about the specific methods of instruction that are most helpful for each learning style, Internet-based courses can be developed that

provide each student with the type of instruction he or she finds most helpful. This can result in more students participating and succeeding in Internet-based instruction.

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Appendix A: Classes Invited to Participate in the Study

Classes Invited to Participate in the Pilot Study

During the Spring 2000 Semester

College							
CCSN		GBC		TMCC		WNCC	
Dept	Class	Dept	Class	Dept	Class	Dept	Class
ACC	151	ACC	220	COT	201	ACC	220
AST	105	COT	134	MATH	181	BIOL	134
AST	104	COT	135	MATH	182	CIS	202
AST	103	COT	207	MATH	283	CIS	121
CIT	235	COT	136	PSC	250	CIS	145
CIT	236	COT	151	PSY	101	CIS	263
EDUC	201	COT	203			CIS	288
EDUC	201	COT	204			CIS	201
EDUC	280	COT	133			ECON	101
ENG	243	COT	101			ECON	102
ENG	205	ECON	104			GEOG	103
ENG	107	ENG	107			HEC	223
ENG	101	MATH	126			MATH	120
ENG	95	MATH	127			MUS	121
ENG	102	MATH	181				
HIST	101	MATH	91				
HIT	117	MATH	95				
HLTH	123	MATH	112				
HPW	190	PHIL	145				
MATH	124						
MATH	126						
MATH	120						
MATH	132						
PSY	101						
PSY	101						
SOC	101						
SOC	102						
SOC	275						
SOC	225						
SOC	101						
SPAN	113						

Classes Invited to Participate in the Final Study

During the Fall 2000 Semester

College							
CCSN		GBC		TMCC		WNCC	
Dept	Class	Dept	Class	Dept	Class	Dept	Class
ACC	151	ACC	220	CRJ	101	ART	115
AST	103	COT	101	MATH	283	BIOL	134
AST	104	COT	133B	PSC	103	BIOL	208
AST	105	COT	134B	PSY	101	BIOL	251
BIOL	130	COT	151	CIT	274	CIS	121B
CIT	106B	COT	203	CIT	275	CIS	201
CIT	235B	COT	204			CIS	202
CIT	236B	COT	207B			CIS	263B
EDUC	201	ECON	104			CIS	284
ENG	095	MATH	091			CIS	288
ENG	101(3)	MATH	112			ECON	101
ENG	102(4)	MATH	126			ECON	102
ENG	231(2)	MATH	127			GEOG	103
ENG	241	MATH	181			MATH	120
HIST	101	MATH	182			MGT	201
HIT	117B	PHIL	145			MUS	121
HIT	118B						
HLTH	123B						
HPW	190						
MATH	112						
MATH	120						
MATH	124						
MATH	126						
MATH	132						
MATH	182						
PHIL	102						
PSY	101						
PSY	102						
SOC	101(2)						
SOC	225						
SOC	275						

Appendix B: Web-based Survey and ILS Scoring Instructions

Internet-Based Course Survey

Information About You

Gender: _____ Age: _____ Grade Point Average (GPA) _____

How much education have you completed? _____

Including this course, how many courses have you taken over the Internet? _____

Overall, how effective has this course been in helping you learn the course material?

Not Helpful at All **Extremely Helpful**

○1 ○2 ○3 ○4 ○5 ○6 ○7 ○8

Part I

Directions:
Following is a list of elements that could be included in an Internet-based class. For each element please indicate whether or not it was included in your class.

If it was included in your class, please rate its:
Effectiveness: Please rate how effective this element was in helping you to understand the course material.
Quality: Please rate the element on how well it worked, how good it looked or sounded and its overall quality.

---

1. Text Presentations- This means web pages that only include lecture notes or text(words only) material. These pages are similar to book pages. This is a basic element of all Internet-based courses.

Included in Your Class?

○ **NO** -Go to next element

○ **YES** -Please rate:

Effectiveness: Not Helpful at All ○1 ○2 ○3 ○4 ○5 ○6 ○7 ○8 Extremely Helpful

Quality: Very Poor Quality ○1 ○2 ○3 ○4 ○5 ○6 ○7 ○8 Excellent Quality

---

2. Pictures, Graphics and Animations- This includes the graphical elements of your course including photos, drawings, charts and diagrams, and illustrations. It also includes animated images. It does not include video or movie presentations.

Included in Your Class?

○ **NO** -Go to next element

○ **YES** -Please rate:

Effectiveness: Not Helpful at All ○1 ○2 ○3 ○4 ○5 ○6 ○7 ○8 Extremely Helpful

Quality: Very Poor Quality ○1 ○2 ○3 ○4 ○5 ○6 ○7 ○8 Excellent Quality

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3. Course Map- A course map, or site map, organizes all of the course resources on a single page. It typically provides a structure to show how the various parts of the course relate to each other.

Included in Your Class?

○ **NO** -Go to next element

○ **YES** -Please rate:

Effectiveness: Not Helpful at All ○1 ○2 ○3 ○4 ○5 ○6 ○7 ○8 Extremely Helpful

Quality: Very Poor Quality ○1 ○2 ○3 ○4 ○5 ○6 ○7 ○8 Excellent Quality

---

4. Schedule and Detailed Course Instructions- Detailed course instructions could include a description of the specific sequence students should follow while working on the course. The schedule includes either suggested or required completion dates for course assignments and activities.

Included in Your Class?

○ **NO** -Go to next element

○ **YES** -Please rate:

Effectiveness: Not Helpful at All ○1 ○2 ○3 ○4 ○5 ○6 ○7 ○8 Extremely Helpful

Quality: Very Poor Quality ○1 ○2 ○3 ○4 ○5 ○6 ○7 ○8 Excellent Quality

---

5. Optional Links for Exploration- These links are not required as part of the course information. They provide access to Internet sites that are related to the course material and allow students to explore topics beyond the scope of the class.

Included in Your Class?

○ **NO** -Go to next element

○ **YES** -Please rate:

Effectiveness: Not Helpful at All ○1 ○2 ○3 ○4 ○5 ○6 ○7 ○8 Extremely Helpful

Quality: Very Poor Quality ○1 ○2 ○3 ○4 ○5 ○6 ○7 ○8 Excellent Quality

---

6. Threaded Discussion- This allows students to communicate with the instructor and classmates in writing, using an Internet newsgroup or bulletin board service.

Included in Your Class?

○ **NO** -Go to next element

○ **YES** -Please rate:

Effectiveness: Not Helpful at All ○1 ○2 ○3 ○4 ○5 ○6 ○7 ○8 Extremely Helpful

Quality: Very Poor Quality ○1 ○2 ○3 ○4 ○5 ○6 ○7 ○8 Excellent Quality

7. Real Time Chat- This allows students to communicate with other class members and the instructor in writing, using an Internet chat service. It may be one-to-one communication, or several students and the instructor.

Included in Your Class?

○ **NO** -Go to next element

○ **YES** -Please rate:

Effectiveness: Not Helpful at All ○1 ○2 ○3 ○4 ○5 ○6 ○7 ○8 Extremely Helpful

Quality: Very Poor Quality ○1 ○2 ○3 ○4 ○5 ○6 ○7 ○8 Excellent Quality

---

8. Audio Presentations- These presentations are similar to a course lectures. They may be live or pre-recorded. They may include voice, music or other sounds and may be accompanied by slides or text pages that provide an outline of the topic. If the presentation is live, students may be able to respond through a chat or e-mail function.

Included in Your Class?

○ **NO** -Go to next element

○ **YES** -Please rate:

Effectiveness: Not Helpful at All ○1 ○2 ○3 ○4 ○5 ○6 ○7 ○8 Extremely Helpful

Quality: Very Poor Quality ○1 ○2 ○3 ○4 ○5 ○6 ○7 ○8 Excellent Quality

---

9. Video Presentations- These presentations are similar to a television broadcast. They may be live or pre-recorded They can include lectures, or video or movie clips relevant to the course. If the presentation is live, students may be able to respond through a chat or e-mail function.

Included in Your Class?

○ **NO** -Go to next element

○ **YES** -Please rate:

Effectiveness: Not Helpful at All ○1 ○2 ○3 ○4 ○5 ○6 ○7 ○8 Extremely Helpful

Quality: Very Poor Quality ○1 ○2 ○3 ○4 ○5 ○6 ○7 ○8 Excellent Quality

---

10. Live Audio/Video Conferencing- This is a live, two-way audio or video communication feature. These conferences require all participants to be on-line at the same, predetermined time.

Included in Your Class?

○ **NO** -Go to next element

○ **YES** -Please rate:

Effectiveness: Not Helpful at All ○1 ○2 ○3 ○4 ○5 ○6 ○7 ○8 Extremely Helpful

Quality: Very Poor Quality ○1 ○2 ○3 ○4 ○5 ○6 ○7 ○8 Excellent Quality

11. **Interactive Problems or Activities**- These are interactive exercises that require the student to enter some type of response. The course material then responds based on the student's response. They include simulations, or text-based exercises and quizzes.

Included in Your Class?

○ **NO** -Go to next element

○ **YES** -Please rate:

Effectiveness:	Not Helpful at All ○1	○2	○3	○4	○5	○6	○7	Extremely Helpful ○8
Quality:	Very Poor Quality ○1	○2	○3	○4	○5	○6	○7	Excellent Quality ○8

---

12. **Instructor Control of your Computer**- This design element allows the instructor to view and manipulate the display shown on the student's computer. It is implemented through software similar to Microsoft's Net Meeting, and allows the instructor to guide the student through specific computer tasks.

Included in Your Class?

○ **NO** -Go to next element

○ **YES** -Please rate:

Effectiveness:	Not Helpful at All ○1	○2	○3	○4	○5	○6	○7	Extremely Helpful ○8
Quality:	Very Poor Quality ○1	○2	○3	○4	○5	○6	○7	Excellent Quality ○8

---

13. **E-mail**- This allows direct and private written communication with the instructor or classmates.

Included in Your Class?

○ **NO** -Go to next element

○ **YES** -Please rate:

Effectiveness:	Not Helpful at All ○1	○2	○3	○4	○5	○6	○7	Extremely Helpful ○8
Quality:	Very Poor Quality ○1	○2	○3	○4	○5	○6	○7	Excellent Quality ○8

Comments

Please enter any other comments or input you might have about the design of Internet-based courses here:

Part II

Index of Learning Styles Questionnaire

Barbara A. Soloman
First-Year College
North Carolina State University
Raleigh, North Carolina 27695

Richard M. Felder
Department of Chemical Engineering
North Carolina State University
Raleigh, NC 27695-7905

Directions

For each of the 44 questions below select either "a" or "b" to indicate your answer. Please choose only one answer for each question. If both "a" and "b" seem to apply to you, choose the one that applies more frequently. When you are finished selecting answers to each question please select the submit button at the end of the form.

1. I understand something better after I
   - ○ **(a)** try it out.
   - ○ **(b)** think it through.
2. I would rather be considered
   - ○ **(a)** realistic.
   - ○ **(b)** innovative.
3. When I think about what I did yesterday, I am most likely to get
   - ○ **(a)** a picture.
   - ○ **(b)** words.
4. I tend to
   - ○ **(a)** understand details of a subject but may be fuzzy about its overall structure.
   - ○ **(b)** understand the overall structure but may be fuzzy about details.
5. When I am learning something new, it helps me to
   - ○ **(a)** talk about it.
   - ○ **(b)** think about it.
6. If I were a teacher, I would rather teach a course
   - ○ **(a)** that deals with facts and real life situations.
   - ○ **(b)** that deals with ideas and theories.
7. I prefer to get new information in
   - ○ **(a)** pictures, diagrams, graphs, or maps.
   - ○ **(b)** written directions or verbal information.
8. Once I understand
   - ○ **(a)** all the parts, I understand the whole thing.
   - ○ **(b)** the whole thing, I see how the parts fit.

9. In a study group working on difficult material, I am more likely to
   - ○ **(a)** jump in and contribute ideas.
   - ○ **(b)** sit back and listen.
10. I find it easier
   - ○ **(a)** to learn facts.
   - ○ **(b)** to learn concepts.
11. In a book with lots of pictures and charts, I am likely to
   - ○ **(a)** look over the pictures and charts carefully.
   - ○ **(b)** focus on the written text.
12. When I solve math problems
   - ○ **(a)** I usually work my way to the solutions one step at a time.
   - ○ **(b)** I often just see the solutions but then have to struggle to figure out the steps to get to them.
13. In classes I have taken
   - ○ **(a)** I have usually gotten to know many of the students.
   - ○ **(b)** I have rarely gotten to know many of the students.
14. In reading nonfiction, I prefer
   - ○ **(a)** something that teaches me new facts or tells me how to do something.
   - ○ **(b)** something that gives me new ideas to think about.
15. I like teachers
   - ○ **(a)** who put a lot of diagrams on the board.
   - ○ **(b)** who spend a lot of time explaining.
16. When I'm analyzing a story or a novel
   - ○ **(a)** I think of the incidents and try to put them together to figure out the themes.
   - ○ **(b)** I just know what the themes are when I finish reading and then I have to go back and find the incidents that demonstrate them.
17. When I start a homework problem, I am more likely to
   - ○ **(a)** start working on the solution immediately.
   - ○ **(b)** try to fully understand the problem first.
18. I prefer the idea of
   - ○ **(a)** certainty.
   - ○ **(b)** theory.
19. I remember best
   - ○ **(a)** what I see.
   - ○ **(b)** what I hear.
20. It is more important to me that an instructor
   - ○ **(a)** lay out the material in clear sequential steps.
   - ○ **(b)** give me an overall picture and relate the material to other subjects.
21. I prefer to study
   - ○ **(a)** in a study group.
   - ○ **(b)** alone.
22. I am more likely to be considered
   - ○ **(a)** careful about the details of my work.
   - ○ **(b)** creative about how to do my work.
23. When I get directions to a new place, I prefer
   - ○ **(a)** a map.
   - ○ **(b)** written instructions.

24. I learn
    - ○ **(a)** at a fairly regular pace. If I study hard, I'll "get it."
    - ○ **(b)** in fits and starts. I'll be totally confused and then suddenly it all "clicks."
25. I would rather first
    - ○ **(a)** try things out.
    - ○ **(b)** think about how I'm going to do it.
26. When I am reading for enjoyment, I like writers to
    - ○ **(a)** clearly say what they mean.
    - ○ **(b)** say things in creative, interesting ways.
27. When I see a diagram or sketch in class, I am most likely to remember
    - ○ **(a)** the picture.
    - ○ **(b)** what the instructor said about it.
28. When considering a body of information, I am more likely to
    - ○ **(a)** focus on details and miss the big picture.
    - ○ **(b)** try to understand the big picture before getting into the details.
29. I more easily remember
    - ○ **(a)** something I have done.
    - ○ **(b)** something I have thought a lot about.
30. When I have to perform a task, I prefer to
    - ○ **(a)** master one way of doing it.
    - ○ **(b)** come up with new ways of doing it.
31. When someone is showing me data, I prefer
    - ○ **(a)** charts or graphs.
    - ○ **(b)** text summarizing the results.
32. When writing a paper, I am more likely to
    - ○ **(a)** work on (think about or write) the beginning of the paper and progress forward.
    - ○ **(b)** work on (think about or write) different parts of the paper and then order them.
33. When I have to work on a group project, I first want to
    - ○ **(a)** have "group brainstorming" where everyone contributes ideas.
    - ○ **(b)** brainstorm individually and then come together as a group to compare ideas.
34. I consider it higher praise to call someone
    - ○ **(a)** sensible.
    - ○ **(b)** imaginative.
35. When I meet people at a party, I am more likely to remember
    - ○ **(a)** what they looked like.
    - ○ **(b)** what they said about themselves.

36. When I am learning a new subject, I prefer to
    - ○ **(a)** stay focused on that subject, learning as much about it as I can.
    - ○ **(b)** try to make connections between that subject and related subjects.
37. I am more likely to be considered
    - ○ **(a)** outgoing.
    - ○ **(b)** reserved.
38. I prefer courses that emphasize
    - ○ **(a)** concrete material (facts, data).
    - ○ **(b)** abstract material (concepts, theories).
39. For entertainment, I would rather
    - ○ **(a)** watch television.
    - ○ **(b)** read a book.
40. Some teachers start their lectures with an outline of what they will cover. Such outlines are
    - ○ **(a)** somewhat helpful to me.
    - ○ **(b)** very helpful to me.
41. The idea of doing homework in groups, with one grade for the entire group,
    - ○ **(a)** appeals to me.
    - ○ **(b)** does not appeal to me.
42. When I am doing long calculations,
    - ○ **(a)** I tend to repeat all my steps and check my work carefully.
    - ○ **(b)** I find checking my work tiresome and have to force myself to do it.
43. I tend to picture places I have been
    - ○ **(a)** easily and fairly accurately.
    - ○ **(b)** with difficulty and without much detail.
44. When solving problems in a group, I would be more likely to
    - ○ **(a)** think of the steps in the solution process.
    - ○ **(b)** think of possible consequences or applications of the solution in a wide range of areas.

When you have completed the form, please click the Submit button below and your learning style results will be displayed. If you are not satisfied with your answers above please click the Reset button below to clear the form.

Submit Reset

William Doherty, doherty@scs.unr.edu

SCORING SHEET

1. Put "1"s in the appropriate spaces in the table below (e.g. if you answered "a" to Question 3, put a "1" in Column "a" by Question 3).
2. Total the columns and write the totals in the indicated spaces.
3. For each of the four scales, subtract the smaller total from the larger one. Write the difference (1 to 11) and the letter (a or b) with the larger total.

   For example, if under "ACT/REF" you had 4 "a" and 7 "b" responses, you would write "3b" on the bottom line under that heading (3 = 7- 4, and the "b" total was the larger of the two.)

ACT/REF			SEN/INT			VIS/VRB			SEQ/GLO		
Q	a	b	Q	a	b	Q	a	b	Q	a	b
1			2			3			4		
5			6			7			8		
9			10			11			12		
13			14			15			16		
17			18			19			20		
21			22			23			24		
25			26			27			28		
29			30			31			32		
33			34			35			36		
37			38			39			40		
41			42			43			44		
Total (sum X's in each column)											
ACT/REF			SEN/INT			VIS/VRB			SEQ/GLO		
	a	b		a	b		a	b		a	b
(Larger - Smaller) + Letter of Larger (see below*)											

*Example: If you totaled 3 for a and 8 for b, you would enter 5b.

Explanation of scores

- If your score on a scale is 1-3, you have a mild preference for one or the other dimension but you are essentially well balanced. (For example, a 3a in the ACT/REF category indicates a mild preference for active learning.)
- If your score on a scale is 5-7, you have a moderate preference for one dimension of the scale and will learn more easily in a teaching environment which favors that dimension.
- If your score on a scale is 9-11, you have a strong preference for one dimension of the scale. You may have real difficulty learning in an environment which does not support that preference.

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Appendix C: Invitation to Participate

Dear Xxxxxx

Please forward this message to your (Course Number) students through your course e-mail and bulletin board or discussion group. We are conducting research on Internet-based courses and would appreciate input from your students. If you are using WebCT, select the text below the line and choose EDIT, COPY from your mail program to copy the message. Then, go to your WebCT private mail or bulletin board and compose a new message. In the new message text area choose EDIT, PASTE to insert the message.

The following provides information about the survey and how to contact me. Feel free to look at the questionnaire, but instructors should not submit the survey for scoring. I would also be extremely grateful if you would cc: me when you forward this message, as a confirmation that it has been sent.

Thanks!

Students,

This is an invitation to complete a survey about your experiences with Internet-based education. The purpose of this survey is to gather information that can be used to improve the design of future Internet-based courses.

You have been asked to participate because you are currently enrolled in an Internet-based course offered by one of the institutions of the University and Community College System of Nevada. If you choose to participate, you will complete a survey on various aspects of an Internet-based course. You will also complete an index of your learning styles and be
provided with an explanation of your preferred learning styles. The survey will take approximately 20 minutes.

If you agree to participate, please go to: http://134.197.14.165/survey/xxxxxx.html

Benefits of the Study
As part of the survey, we will provide you with information on your learning style and how you
might be able to use that information to improve your own learning. We also hope to gain information that can be used to improve the design of future Internet-based courses.

Confidentiality
Your response will be completely anonymous. We will only keep track of how many responses we receive from each class for research purposes. Results for individual classes will not be calculated. Your response will be stored for approximately one year in a secure file only accessible by the researchers. As with any other information sent on the Internet, there is a slight possibility someone may intercept your results when you submit

them.

Participation in this survey is voluntary. It is not a required part of your course and it will not affect your grade or your standing in your course in any way.

If you have any questions or comments, please contact me directly at doherty@scs.unr.edu or 775-673-7284.

If you agree to participate, please go to: http://134.197.14.165/survey/xxxxxx.html

Thank you,
Bill Doherty
Graduate Student,
University of Nevada, Reno

Graduate Advisor
Cleborne Maddux, Ph.D.
University of Nevada, Reno
Phone:775-784-6637 x2061

Appendix D: Student Comments

Note - Student Comments have not been edited for grammar or spelling. Instructor names and course name have been removed to protect anonymity.

Comments from Pilot Study.

1. I can see the potential of all of these items in WEBCT but hardly any of it was used in my class and the things that were used had problems. I feel that the instructor should have been provided with extensive training in order to assist us in getting the most out of all that was available. I have been taking on-line classes through the University of Phoenix and right now they are far superior in quality to this type of course only because all of the potential of this program is not utilized.

2. I like the internet course it makes it a little easier to do classes when you can attend when you want. Working a full time job it sometimes is difficult to get a class time to fit in your schedule. You do miss the one to one you when you are in a classroom setting.

3. The instructor is to be given full marks on his tuition.

4. this is a very good site for a online class the teacher is helpful and goes out of his way to help you thank you (instructor name) for all you help

5. the biggest problem seems to be with the server and web CT the server is slow and web ct chat works when it wants to some times the class will be on line in the chat room. then when you try to log on it says the says the chat server is down. then the next day you get an e-mail asking how come you didnt show up. i will still take the classes on line BUT wish they would fix some of the bugs.

6. The Chat Room for the Office Hours were changed weekly and it was hard to keep them because of other evening classes. Also the instructor changed the tutorials that were in the book and sometimes it was hard to understand just exactly what it was that he wanted. He did give us a chance to get extra credit for extra work but when I lost contact with the Chat Room I couldn't get into his office hours and had to make up some questions. I never did find out why I couldn't get back to the Chat Room.

7. This course (course name) was very well put together It was nice and very easy to navagate. I enjoyed it the only thing that I thing would be a good add on would be a grading thing so you are able to see what your grades are as you go along

8. well the chat doesnt work and I have had nothing BUT problems with this class I will never take another online class again

9. I had more interaction with the professor and students thru this internet course than I do in the regular classroom.

10. Poor interface between instructor and online material. Lots of problems with the

software working as intended. Basically the class was read the purchased text take the online test. No class interaction other the e-mails that focused on software problems with the course itself or scheduling questions. Would not repeat any class with this company.

11. Many of the options in the internet portion of the class didn't work well. The first problem was that the internet class was last years version and didn't quite match the book. It was upgraded half way through the class. The previous version's grades never made it to the new version. The self checks on the new version didn't work. It will be very hard to talk me into taking another internet based class. Half of the effort of any class is fiquring out what the instructor is expecting of you and how they grade. It is about impossible to do that without the benefit of the classroom. This has been a most difficult class whereas most of my other classes didn't seem as hard.

12. I have always hated math; however (instructor name) has made this class both fun and educational.

13. This was my first course on the internet and it helped so much that I could turn my work in on the internet and not worry about being to class on time.

14. Unfortunately this is the only internet course I have taken which has not lived up to my expectations. This instructor has not been very good about getting back with students. We've been plugging along almost blind and this course (course name) requires feedback. Don't learn anything if you don't know what you've gotten correct and incorrect.

15. They are wonderful! I actually converse more with students on these courses than I do in the 'real' lecture. whether that is a good thing I don't know yet!! If only we could effectively do Labs online!!! haha

16. I am currently enrolled in two internet based courses this semester however I was informed to only comment on one of them from which I received this link to. The class is (course name) and all of the assignments are done from home through a book not so much on the internet. The other class I am enrolled in is (course name). This class however is highly innovated by webpages and I feel it would be more appropriate to comment on that class rather than computerized accounting. If you would like for me to do so please send me the link via e-mail to (e-mail address) Thank you

17. I felt that the course was presented very well and the Instructor was very helpful.This was the first Internet-based course that I'v taken.

18. This was a very good course with an excellent instructor. It was a lot of work but I learned a lot.

19. My instructor was very open in her communication any time I had a question I would email her she always responded the same day. I think internet courses are very effective

but you also have to be very self motivated. The only problem I encountered was when I was in a area and stuck trying to find the time to get in to the instructor the instructor though was very flexible about meeting with me.

20. Internet courses are great and Web CT has been exceptional. I find that some instructors have different ways of using Web CT which can be good. But I think that there should be certain criteria that should be included in all Internet courses. Such as a page that shows our assignments; whether or not the instructor received them and what grade we got. That should be standard for all Internet classes.

21. I enjoyed this class very much. The instructions on the syllabus were clear and the instructor's directions were easy to follow. I would definitely recommend this class to others.

22. (Instructor name) was awesome. She always answered my questions in a quick and efficient manner. She always made us feel like she really cared. I definitely think she deserves a bonus or a raise. She is by far the best instructor I've had yet at CCSN.

23. I think more subjects should be available online because I find them to be a great way to learn when you also have other responsibilities also.

24. The design of this class was of great quality. The student page was great you always knew where to go for the information that you were looking for.

25. Internet based courses are designed for people with a LOT of self-discipline. Sometimes it is very difficult to learn the material presented without the help of an instructor standing over you. Also it takes a little longer to learn and understand the material because you have to teach it to yourself and figure it out on your own. However I prefer Internet classes over the traditional classroom classes because it allows me to attend class when it is convenient for me.

26. I really enjoy the internet courses. I work full-time and it makes it easier for with such a busy schedule.

27. I've taken 9 DE classes at CCSN-These classes work best when an active exchange between students takes place. This is not always the case. The technology is not fully utilized--but I don't know the $$$ limitations on curriculum development. DE is an excellent concept and will only grow but it requires rethinking teaching methods.

28. Our class used webct which seemed to be down often and there were many problems with the chat feature. Also because netscape had to be used i had many problems with aol kicking me offline in the middle of chats or reading e-mail because aol messages don't pop up over the netscape screen.

29. I like having this option available. It gives people with weird schedules a chance to

take classes that normally wouldn't be availbe them.

30. the important information that is assigned for graded work i feel is the same important information that should be on the test. not changing from important assignment information to other important test information. students are not sure what is really important

31. I would like to see more courses offered

32. Well I would suggest that the teachers come on the computer more then 3 times a week. Also More communication between student and teacher on computer.

33. The hardest thing I found when doing this internet course was that there was too much information in such a short amount of time. This problem didn't allow for sufficient memorization. I became very confused with the vast amount of methods formulas etc. when it came to the tests. I did rather well when I could be a librarian and look up the needed information. But when it came to the tests it was more a measure of how much you were unable to memorize as opposed to how well you can solve a problem by knowing where to took for the answer. I think testing can be very unfair in that not everyone tests well. It would sure be nice when the school systems can see that. Just because a student of any age doesn't do well does not mean that they are stupid or that they hadn't spent a great deal of time studying. Which both reflect my situation perfectly. The best way to teach is knowing how the student learns.

34. I haven't completly finished my (course name) course and have been granted an extension due to an disability and find this internet course very beneficial to me and the teacher also.

Comments from Final Study

1. I find the internet classes very beneficial! I plan to take more next semester.

2. The design is fine, but the class itself is hard to pick up on when the texts don't explain well enough.

3. I love it, I just wish I could take all my classes on line.

4. Have all the Instructer's use the same format, so that each semester, the student is already familiar with the web page and where things are located.

5. "Taking this class has been very beneficial for me, due to my schedule."

6. I'm currently taking 5 classes over the internet, and only 3 of them are using the internet. This makes it difficult because I live in a rural town. If all instructors were on the same page, things would be a whole lot easier, and it would really be distant education.

7. it would be great to get into the discussion group and get the homework thru the proper channel. also receive books tues of third week and had to scrap around to get quiz assignment

8. It is dificult to rate the curriculum as I am one of the ones who just got their kit. So far I like the format. I believe that once I have time to catch up to the rest of the class, my view will change for the better.

9. I would rather attend a "live" class with student/teacher interaction than take an Internet course. However, I'm glad Internet courses are available when "live" classes aren't possible.

10. I like it better when you are allowed to work at your own pace. I am the type of person who likes to do alot of things at once, instead of a steady pace. I find myself discouraged when pushed and told that I am behind. For example, a situation arose last semester that had me unable to do steady work. Ultimately, I did all of the work in two weeks and it was of such quality that I earned an 'A' in the class as a whole. If I wanted steady and dictated schedules, I would go to campus classes.

11. Perfer not to have to take an internet class as something always goes wrong, such as the server going down with out warning confusing to get around in lots of times, should be self-paced, if an internet class, cause when it's not, it's too hard to try to get a set time when everyone can do live chat! Such as in may case.

12. The course does not have a whole lot interactivity other than telneting in. We just read the book try it out and answer the question on the exam.

13. I have been taking on-line classes for 3 years now and they are only getting better. Since webct I have an easier time organizing my on-line classes.

14. The Intro to Unix course has an excellent text for self study. The internet so far has been used as a median to TELNET to an Unix server on which exercises from the text are practiced and as an avenue to and from the instructor for information and questions.

15. So far I am happy with this system..For a first timer, I am being forced to push my own development.

16. I know of other students who have had successful internet courses. I must be having a bad experience.

17. I do wish that our homework was corrected more than once a week, so if you wanted to work ahead you can. Our professor doesn't allow "at your own pace" or "working ahead". I think this holds some students back.

18. In my current classs thier is an assignment do everyday. I think that defeats the purpose of taking a web based class.

19. I think some internet based classes are wonderful. However, there are classes which would be much better live. Some things need to be seen to be understood.

20. I think there needs to be better directions on how to use the available resources such as: threaded discussions. Many intrnet students are limited in their computer experience!

21. I find Internet-based courses very useful and particularly suited to my work schedule and personnal interests. The only complaint that I have is that there are very few technical courses such as physics.

22. If classes are done by Internet or by Television any type of distance Ed class all test should be done on the computer. More distance Ed classes should have weekly lectures off the TV too. That's including Elementary Education 201.

23. I like having a class that I can just get the stuff done without all the extra fluff in lecture classes that's just a waste of time.

24. I am given an opportunity to work at my degree during the year that I live hours away from the nearest college or university. This is fabulous and I love the opportunity to do something that if I wasn't getting done now might never get accomplished.

25. it's great

26. This class has been a great experience. The teacher is helpful through e-mail and chats. Great class site design!!

27. I believe web based classes were designed with the intention of giving the student the freedom and opportunity to continue his or her education outside the confines of a structured, classroom enviroment. I believe the idea of a a web based class is a great one, if we can teach our instructors to stop teaching web based classes as if they were in a regular classroom enviroment. I do not believe in mandatory chat sessions that are required as part of your grade. If I wanted to take a class where I had to be in attendance at a given time during the week, I would have taken a traditional college course on campus. I also do not believe that tests should be proctored at a campus location. I take web based classes because I am a working, wife and mother of two small children. Web based classes should but do not always, afford me the opportunity to continue my educational goals without the constraints of a tradition classroom enviromente

28. I found class web page confusing. I had to print it all out just to try and make sense out of it all. The lecture notes were often word for word right out of the book. I could probably do away with the book and just focus on the lecture notes. Chat rooms are not structured very well, often confusing, highly annoying, and most of the time a waste of time. I think the bulletin board provides an adequate Q & A format. I have to take the midterm and final tests in front of a proctor. I'm taking the internet classes because of my ever I had to take time off from work to get a WNCC library card to access their database. Should have been able to do this online.changing work schedule, so how can I schedule a proctor when I don't know my schedule?

29. I enjoy this style of learning! I allows me to be at home with my teenage daughter and still enrich my intelect.

30. This is actually one of three internet classes I am taking this semester. I would rate it as the best one of the three.

31. I really like taking the internet course it allows me to participate in the class on my own time. I wish the instructor would post some of the discussions, because I work at the time they are held, and post class notes.

32. I love them! It is so much easier to keep my grades up because I actually enjoy the freedom of an online class.

33. I find that the chat logs, which we use as reference works, don't have text wrap. Consequently, when I print the log, many of the sentences are cut off. Poor planning!! If there is a way to correct this on the users end, they should make that more obvious.

34.I am thoroughly pleased with the design and content of my internet-based courses. I would sign up for any of my classes by internet, if available. You have a winner here!

35. Sometimes there are "glitches" in the WebCt program, but overall I've found it very useful and with out it I would not be able to attend school!

36. I enjoy my web ct classes the only problem is that AOL continues to have script errors all the time..

37. If Community College of Southern Nevada did not offer DE (Distance Education) Courses via Internet, I would not be getting my AA degree this fall. It allows someone my age (31) to get a degree while still holding down a full time job and full time life (family/house " etc.), Thanks!"

38. I miss the interaction with class and teacher. Web based class is convienient for us busy people!

39. The ability to almost be able to obtain an entire Associates Degree over the internet is extremly helpful and I'm sure gives accsess to those who would other wise feel they could not go to school. Any course based on reading material and then taking quizzes, writing papers, giving presentations, ect, on that material is valid as an internet class providing the student works hard. Lack of teacher interaction can be tough but not situation is perfect. In all honesty internet classes have changed my life for the better.

40. I love the internet courses. I don't want to have to go anywhere to have to take a class. I want the material and some guidance on how to get through it. Then I want to be left alone to do it. Internet courses, when done right, give me what I have always needed to learn.

41. I like being able to work at my own pass and fit the classes into my schedule instead of fitting my schedule around my class. I have only taken math class over the Internet and have done relatively well. I also know several people that are able to take more classed at a time because of Internet classes.

42. I have none since I am very new to this technology but so far so good.

43. It would be helpful for our course material be emphasized in the bulletin.

44. xxxxx's class is one of the most organized internet courses I've dealt with. Her class overall is extremely effective in conveying course materials.

45. I wish there are more classes available on the internet.

46. i like having this internet course and i will take more in the future it saves time.

47. I had a problem sending e-mails through the data base the Community College has because I have AOL as my Internet provider. Now I found out that using Juno I can communicate with them. It should be made user friendly for every IP company you have.

48. I am not sure if we have chats yet. I believe we are set up for them but I have not partcipated

49. I'm deaf and I fine this very helpful.

50. The only thing missing from the second internet based class I'm taking is the weekly chat. Although at times the quality may lack the inter-action between students and the instructor we're very helpful in gaining understanding about each weeks assaignments. And somewhat gave you the added feeling of belonging to a class. Without it, it seems a little like watching from the bleechers.

51. The Chat sessions are not convenient to my schedule therefore I only rated them as average because I can't use them. Everything else is terrific. These web-based courses are great for those of us that can't get to the campus for a regular class. Maybe you could consider cutting the semester in half so that more internet courses can be offered and completed.

52. Actually getting started is very difficult. Setting up, getting started, learinng each class format- they are all different.

53. The booklet that you put out for WNCC is excellent.

54. They should not be too dependent upon live interaction " because many students cannot arrange their hours to include an uninteruppted period for this at a ""normal"" time of day."

55. the chapters in the text each had a wealth of information yet the quizzes only asked 10 questions that seemed very irrelevant to all the valuable information that we may have wanted to know and keep. Also the timing of quizzes - 15 to 20 minutes-- limited our ability to really read each question and answer intelligently.

56. I'm in two classes. One is excellent and one is not. I have rated the excellent one.

57. i really like how the class is set up. its neat having a schedule handy at all times. i really like the bulliten board, being able to communicate with my instructor and classmates is wonderful.

58. I do not prefer an internet type of a math course I need to have a structural study session when it comes to math. Internet-based courses are good for extra materials or extra help adding to a lecture and overview of the chapter in class with the instructor.

59. They wouldn't be such a joke if there weren't so many bugs in the system. I cannot believe that a College would allow classed to be taken online with this many problems. I will never go near another internet course again.

60. I think it's an excellent idea for internet-based courses. It allows one to create their own hours to do the needed homework tasks and lowers the stress level of meeting at a time one can't commit to. I hope it continues and grows each day!

61. Just THe one time I did participate in the live chat. He did not discuss very much of the chapter just off-the-wall stuff from mainly one studnets questions.

62. I love the freedom the internet class is giving me. These are excellent classes for busy's lives.

63. honestly, i will never take another class on the net, but it isnt the instructors fault, i just forget.

64. I have really enjoyed taking an Internet-based class and hope to see more courses (especially in Business) offered in the future!

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